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East Europe Report

SCIENCE & TECHNOLOGY

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PLANS FOR NUCLEAR POWER PLANT SAFETY DISCUSSED

East Berlin SPECTRUM in German No 3, Mar 84 pp 1-3

[Article by Klaus Fuchs, member, GDR Academy of Sciences]

> [Excerpt] Nuclear power plant safety is a matter for research. Views differ when man's role is involved. Surely, boredom at an automated control panel is not something to be dismissed lightly but this is also precisely why counter-measures must be devised. Does everything have to be left to automatic devices?

The viewpoint to the effect that man remains the central safety factor as regards the reliability of production facilities also or precisely in connection with the exploitation of all of the advantages of automation also determines the studies conducted at the Academy on the Problems of the Surveillance, Monitoring, and Control of Nuclear Power Plants; the judgment capability and sense of responsibility of man, as the central safety factor, can be supported very effectively but cannot by any means be replaced by automatic devices. In automated production, the important thing is to increase the clarity of system complexes as well as the recognizability and controllability of processes taking place in the production facilities, especially in the case of foreseeable and unforeseeable disturbances. This procedure is fully consonant with the safety philosophy of Soviet scientists in the research on and development of nuclear power plants.

Systematic work on the development of the WWER-type of PWRs, which are also being used in the GDR, guarantees the care with which Soviet scientists and engineers from the very start included the problems of nuclear safety in research, design, and construction. The aspects of reliable operation or the restoration of reliable operation or, if necessary, quick shutdown are the highest commandment during all work phases, from basic design, draft sketches, via construction and production all the way to assembly and commissioning. This is why quality assurance and quality monitoring run through the entire series of events. It is not only important to make sure that each piece of equipment will work reliably. In addition to that, it is necessary to pay attention to the cooperation of the plant components and it is necessary to

examine all possibilities so that negative factors (for example, corrosion-promoting contamination) cannot cause any damage due to reciprocal effects.

Naturally, even in case of careful analysis one cannot rule out the possibility that error sources might be overlooked or underestimated. The systematic analysis of all experiences, which was performed in the Soviet Union as preparation for the safety concept for the WWER-1000 in the middle of the 1970's shows that insufficient attention was devoted to the way work material properties are influenced during long-term operation.[6] This is why the development of the required work material examination technique--which after all is also important in other fields of technology--was developed into a main point also in the Academy's research. The same experiences were reported later on likewise from the United States.[7]

From these and other experiences one can see that the engineering diagnosis--which makes it possible early to spot and if possible quickly to correct deviations from the normal state of the plants and from routine operation, to recognize them and to explore their causes in order to take corrective action--has constantly gained importance with respect to the reliability of the nuclear power plant. As readers of SPECTRUM know, technical diagnosis instruments, developed at the Central Nuclear Research Institute, were installed in the first block of the Greifswald nuclear power plant already in 1973. A few years later came the first international use of a comprehensive noise analysis system for monitoring current operations which in the meantime has been installed in all reactors of the Greifswald nuclear power plant with types that were improved several times.

There was an international exchange of experience on noise analysis even at that time and the Central Nuclear Research Institute also participated in it. One must ask oneself why this method came into international use so slowly. A partial answer is supplied by the above-mentioned report on the damage in the Harrisburg nuclear power plant: "The requirement for additional instrumentation for support in trouble investigations and monitoring was investigated by the NRC (the appropriate nuclear energy authority of the United States) already in 1975 but its implementation was delayed due to opposition from industry, such as it was represented by the Atomic Industrial Forum." Could this opposition be connected with the fact that the builder of the nuclear power plant is reluctant to give the operator the means for precisely determining the causes of damage?

Soviet Minister Petrosyants years ago pointed out what important task resides in the earliest possible recognition of trouble in the reactor, discovering the causes, and reliably guaranteeing safe operation.[8] The complete accomplishment of this task became possible through modern equipment engineering and electronics. The Academy and the colleges of the GDR are working on this intensively

in collaboration with industry. This involves sensors for the exact recording of measurement data, microprocessors for their processing, light conductors for safe transmission, process computers for analysis, for comparison with the mathematical models, and for fleshing-out for reporting purposes which is available to the plant operator via modern control station design and which enables him to communicate directly with the plant and the technological process through question and answer. Much has already been prepared and achieved on this route; but I am convinced that the next several years will bring decisive results in hardware and software in data processing for the intensification of the production processes.

Plant Operators with College Degrees

The introduction of process data engineering, which became possible by virtue of microelectronics, and its integration into the automation system as its integral and absolutely indispensible component establishes new requirements for the qualifications of the plant personnel, especially the system operators. This is where international opinions differ widely. Along with extensive agreement on basic and often also detailed questions of technical problems of nuclear safety, opinions differ when it comes to man's role in the nuclear power plant. The damage at Harrisburg enlivened the controversy but did not yet put an end to it. Considerable progress can be seen in the fact that the IAEA--in analyzing its conference on questions of nuclear safety, held in Stockholm in October 1980 and in analyzing the damage at the Harrisburg nuclear power plant--subscribed to the idea that the reactor system operator must have a college degree--and that he must have diagnostic instruments available for analysis and decision-making in a damage situation.[9]

What are the arguments which are being cited against higher skills for reactor system operators--something which in the socialist countries is quite natural? Typical here is a round-table discussion which was published in "Bild der Wissenschaft" [Picture of Science] under the title "Foreman or Engineer."[10] The dominant argument was this: One simply cannot expect an engineer to put up with the boredom of an automated system. He loses interest, his attention is diverted, he atrophies, or he looks for another job. One consequently then goes so far that not even the shift boss may have the qualifications of an engineer.

One cannot deny that boredom at the control panel of a highly automated system can constitute a factor of danger. When attention wanders, a signal can be overlooked and the speed of reaction is restricted, not to mention the long-term effect on morale. But I do not see why boredom should better fit in with a foreman's job description than with that of an engineer. The trouble has to be tackled at the roots. We cannot do without higher skills because they are a prerequisite both during routine operation and trouble for the reliable operation of a nuclear power plant. But the tasks of a system

operator must be so demanding and his skills must correspond to that so that this will result in an interesting activity that fully demands the individual's attention and capacity. That is possible even today although the conventional design of the control panels and stations as well as the inaccessibility of the system do set certain limits.

The last barriers are being removed with the introduction of the modern process information system which is based on an effective system of technical diagnosis and dialog technique. A nuclear power plant is a complex system with complicated scientific-technical problems. It also became highly interesting for Academy researchers the moment they unravelled its secrets with the help of technical diagnosis.

It is one of the noblest tasks for Academy scientists to let the system operators share in the joy of discovery connected with this excursion into the interior of the reactor and to give them the means for becoming completely familiar with their "reactor" with all of its individual strengths and weaknesses, including its aging manifestations and the possibilities of a rejuvenation cure. But the reactor system becomes highly interesting when the sensors are present for penetrating into the secret stirrings of the reactor. Our scientists had that experience with noise analysis at the "Bruno Leuschner" nuclear power plant. The system operator should be a participant in this achievement of data processing technology in the nuclear power plant--in the fullest sense of the technically highly qualified socialist owner of production.

FOOTNOTES

6. V. A. Sidorenko, O. M. Kovalevich, et al., ATOMNAYA ENERGIYA [Atomic Energy] vol 43, November 1977, pp 360 ff.

7. E. Herbert, IEEE SPEKTRUM, September 1982, pp 56 ff.

8. A. M. Petrosyants, ATOMNAYA ENERGIYA, vol 31, 1971, p 326.

9. IAEA Bulletin, vol 23, 1981.

10. "Foreman or Engineer," "Bild der Wissenschaft," 1, 1981, p 116.

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CSO: 2302/44

POINT OF TIME PROGRAMMING WITH STATIC RAM

East Berlin RADIO FERNSEHEN ELEKTRONIK in German Vol 33 No 2, Feb 84 pp 127-128

[Article by Andreas Barsch]

[Text] BCD coded output signals of a digital clock are used directly as the address for a RAM with the circuit for point of time programming described in this article. Programming in 10-minute intervals is possible in the simplest case.

It is often necessary to trigger processes at certain points in time by using an electronic digital clock. The versions described in the literature are based on the use of BCD coded preselected switches and cyclic memory polling. The version suggested here uses the clock BCD coded counter outputs directly as a RAM address. We can thereby, among other things, dispense with a TTL EXCLUSIVE OR gate (e.g., a 7486) and/or a BCD coded preselected switch. Any digital clock operating with BCD coded numbers with accessible counter outputs can be used.

Fig. 1 shows the circuit diagram. In the program process, the multiplexer switches program unit data to RAM address inputs. During the read process, the clock counter outputs are driven through. The data at the RAM address inputs are displayed so that the selected time point can be checked during programming. The analysis circuit implements the load driver, a result buffer if necessary and a selection function.

Storage and Analysis

A U 202 D static RAM was used for the memory. Its full TTL compatibility allows simple switches when a clock operating on the basis of TTL circuits is used. In principle, other static RAMs with matching characteristics of level definition, memory size and organization are also usable. Access time is not a critical factor.

The U 202 D is a 1024x1 bit RAM with 10 address inputs.

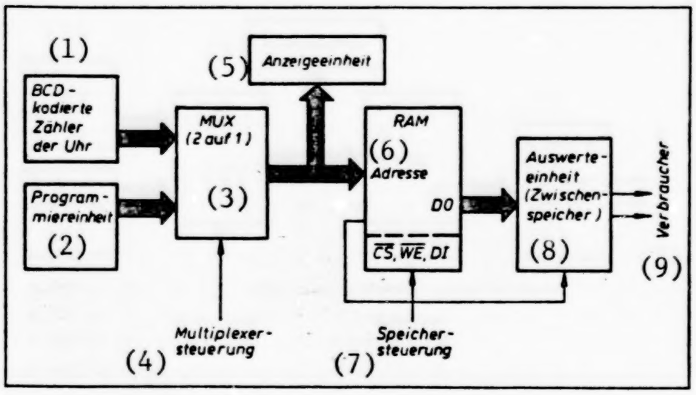


Fig. 1. Block diagram of point of time programming

Key:

1. BCD coded clock counter
2. programming unit
3. MUX (2 to 1)
4. multiplexer control
5. display unit
6. RAM, address
7. memory control, CS [chip select], WE [write enable], DI [data in], DO [data out]
8. analysis unit (intermediate storage)
9. load

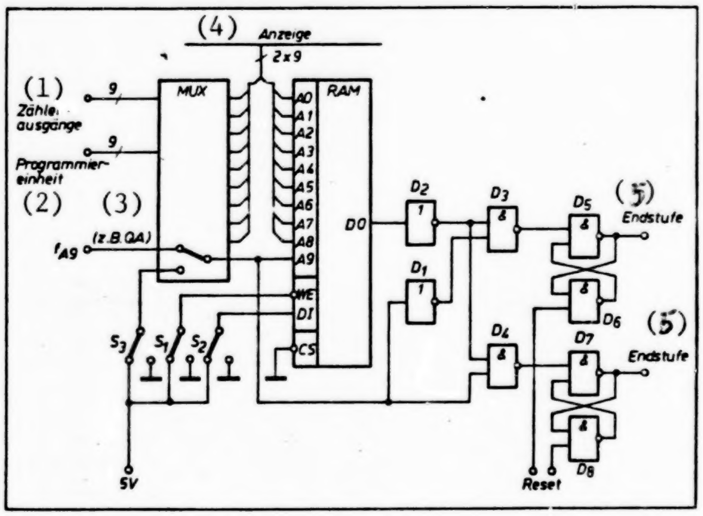


Fig. 2. RAM wiring and analysis (basic version)

Key:

1. counter outputs
2. programming unit
3. (e.g., Q_A)
4. display
5. output stage

The following allocation results from that:
hours tens = 2 bits
hours units = 4 bits
minutes tens = 3 bits

Programming in 10 minute intervals is also possible. An expansion can occur with another RAM driven by the remaining counter outputs (minutes units = 4 bits, seconds tens = 3 bits) according to the precision desired.

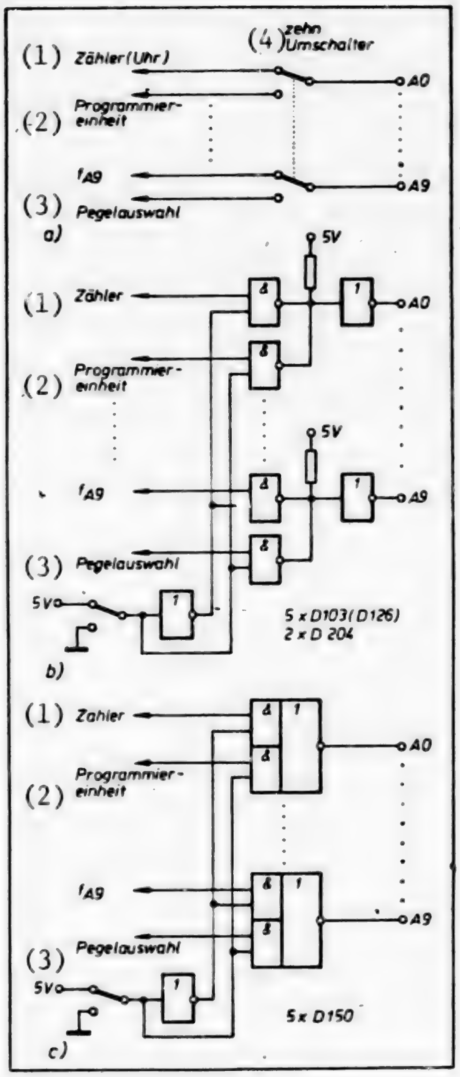
Based on the RAM organization, only one load can be driven directly. This drawback can be removed by connecting several RAMs in parallel on the input side. The proper RAM can be selected and programmed by CS [chip select] input addressing. With that, when the data outputs are read as binary coded data words, 2^n-1 (n = number of RAMS connected in parallel) loads can be driven with proper decoding. The disadvantage of this circuit is the high cost.

Fig. 2 shows a version using the remaining tenth address input to select two different loads. The RAM is L active programmed, i.e. an L level at output triggers the programmed process. The proper load is selected by programming S_3. S_1 (read/write) and S_2 (data select) are also controlled to write the L level in the memory cell addressed.

To avoid switching errors, ensure that all memory locations that can be addressed by the counter outputs have an H level before the first programming step after starting the circuit.

During the reading process, a periodic L-H change, the frequency of which can be selected in a large range, occurs at A_9. The upper limit for this is defined by the access time of the RAM used, i.e. $f_{A_9} < 1/2\ t_{ACC}$ for a pulse duty factor of 0.5 (t_{ACC} = 400 ns for the U 202 D). The lower limit of the clock frequency at A_9 is the permissible interconnection delay of the second load. This delay results from the use of the clock pulse as the tenth address bit. The delay is $t_D = 1/2f_{A_9}$. This clock pulse can be shaped e.g. by the output Q_A of the seconds units counter of the clock. Then the delay is 1 s.

It should also be assumed that A_9 was addressed with an L level by the previous programming step to select the first load. When the set time is now reached and an L-potential is at A_9 through Q_A of the seconds units counter, an L-level appears at DO [data output] as well. Gate D_4 is closed by the L potential at Q_A. Both D_3 inputs are at the H level so that flip-flop D_5, D_6, used as intermediate storage for the information received and to drive the load output stage, is set. It is reset by pulses which are to be generated according to the specific application. This could also be time information or an external process. The RAM data output is loaded by gate D_2 only with a TTL load.



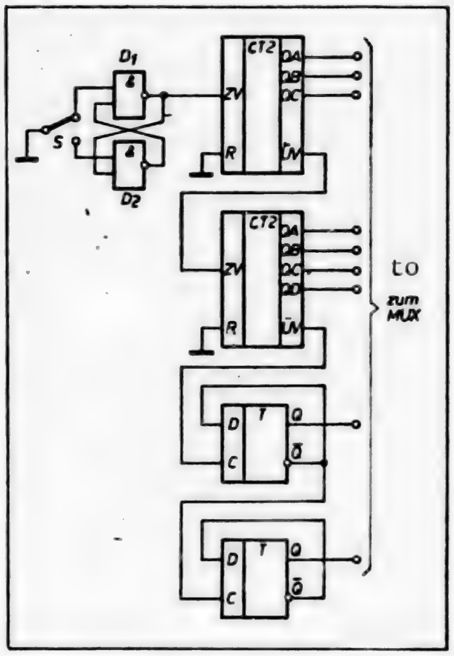


Fig. 3. Multiplexer versions

Fig. 4. Programming unit (counter version)

Key:

1. counter (clock)
2. programming unit
3. level select
4. ten switches

Programming can be checked by the fact that in the writing process, the DO potential follows that of the DI, provided the address is constant during the access time. The load selected must respond accordingly when there is no error.

Multiplexer

The quasi static mode of operation leads to the possibility of implementing the multiplexer by a corresponding number of coupled switches (fig. 3a).

Fig. 3b shows a version using open collector gates, the outputs of which are connected in parallel in pairs. When NAND OC [open collector] gates are used, a negation is still required subsequently. The solution in fig. 3c using AND-NOR gates (D 150, for example) is better. The problem can also be solved with 10 integrated 2-to-1 multiplexers (3 x 74157, for example).

Programming Unit

The programming unit supplies the address bits of the time desired during programming. In principle, the two ways to implement this function are to use counters or mechanical switches and plug-in jumper wires.

Fig. 4 shows the programming unit built with counters. The address bits are generated using decimal counters (D 192 D, e.g.) and D flipflops (D 174 D, e.g.). The clock pulse by which the time desired is generated as the RAM address can be supplied by switch S or manually.

D_1 and D_2 are necessary to debounce switch S. In principle, single clock pulsing of the counter, for example, is also possible. When switches (DIP switches, e.g.) or plug-in jumper wires are used, the appropriate levels are generated directly. Although this solution is indeed simple, it is difficult and costly in operation. In this connection, it must be pointed out that when levels are generated directly by switches, the inputs can remain open at the H level desired, unlike TTL switches. There must be a voltage U_H applied which satisfies the condition $2 \text{ V} <= U_H <= U_{CC}$ ($U_{CC} = 5$ V). This also applies to the inputs CS, WE and DI.

Summary

In principle, the suggested solution for point of time programming is a good price/performance compromise. With that, using only part of the RAM capacity is not considered a disadvantage.

By peripheral switching of the basic version, various tasks can be accomodated well. Thus, when two U 202 Ds are used, programming in 10-second intervals is possible. When the four unused address inputs are utilized at the same time and with appropriate decoding for load selection, 15 loads can be controlled. Also possible is an arrangement which displays all times already programmed on request and thereby allows checking memory contents.

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CSO: 2302/33

TEXT PROCESSING ON LARGE UNIFIED SYSTEM COMPUTERS

East Berlin RECHENTECHNIK/DATENVERARBEITUNG in German Vol 19 No 12, Dec 83
pp 11-14

[Article by Claus Bischoff, Berlin Applications Research Center VEB, Karl-Marx-Stadt Branch]

[Text] Large computers such as those in the Unified System offer a number of advantages for text processing users. The capabilities of general text processing should be stressed, starting with text entry using a terminal screen or other input media through text manipulation to printing the output. Software for text processing has been developed in parallel with computers and operating systems needed to run them. While the EDVA [EDP] systems in the Unified System series I can process text data only in the batch mode, more modern EDP systems like the Unified System series II offer the advantage of interactive processing. This is expressed by the capabilities of the MATEX and TEPROS text processing programs. Standalone utility programs convert data format, code text data and link programs.

Machine Processing of Text -- Need of Development of Science and Technology

The vastly increased capabilities of computer hardware, especially the high operating speeds and increased storage capacity, and the capabilities of linking hardware and data teleprocessing (DFUe), have led to efficient use of this hardware for the most varied tasks in many areas of the economy. In addition to the classical areas of scientific and technical calculations and economic and commercial data processing, computers are also being used to an increasing extent for processing the most varied written documents (text and documentation, thus non-numeric information).

The advantages of large central computers for text processing are:
--multiuser storage and simultaneous availability of a larger number of text files
--central storage of text files and processing programs on the one hand and decentralized access to text files on the other
--use of system and hardware resources of the EDP system as for example, access routines, remote DP equipment or the EDITOR program as well as the

combination of facilities
--use of a large instruction set and the high operating speed to implement more extensive functions
--capabilities of executing text processing in parallel with other system operations or linking them to other EDP processes and thereby achieving a favorable price/performance ratio with a good system resource usage rate
--text manipulation in the interactive mode
--capability of outputting edited text on different data media for further specialized processing as for example, for photo composition or typesetting, microfiche or small systems hardware
--capability of processing data acquired decentrally
--capability of machine storage of documents in their totality through computer linking, decentralized queries and making parts available in readable form

Function Spectrum of a Text Processing System

The total spectrum of functions that must be implemented by programs for machine text processing include the text processor, text manipulator, and the text management and inquiry program as well as auxiliary service or utility routines.

Text Processor

The text processor includes all functions pertinent to formatting text pages. (The function spectrum implemented by TEPROS generally meets these requirements.) Setting up tables of contents and indexes for illustrations, tables and subject words during output are other functions of the text processor.

Text Manipulator

Text file creation and editing such as text insertion, correction, deletion, move and copy and text processing commands are text manipulation functions.

Text Management and Inquiry Programs

Functions to manage stored text files and segments as well as to find and make them available again are:
--management of storage and storage ranges allocated for individual text files
--management of corresponding directories, for text segments as well
--text file input and output
--making text and segments selected by the user (subscriber) available
--access security and authentication.

Service and Utility Routines

In addition to the functions listed, which belong together at one time, others are intended to handle a number of special tasks by software mainly by using different equipment in the off-line mode: conversion of data acquired decentrally, production of data media to control special hardware or conversion of text data from other text processing systems.

[boldface insert] The use of a large central computer for problems of text processing plays a considerably higher role with hardware and operating systems which allow efficient subscriber operation, especially when
--large amounts of text have to be processed
--this text has to be updated continually
--and output has to be ready to print on short notice, in the required typeset quality if necessary.

[boldface insert] The interactive programming and test system (PTS) offers advantageous text processing with TEPROS. This pertains especially to
--unformatted text entry
--text output in any format
--interactive operation
--rapid access to text data (rapid updating)
--easy changes to stored text files
--supported table and column processing
--automatic set up of table of contents. [end of inserts]

The prospective workarea for the text processing system user is the terminal screen. The video terminals now available generally display text in capitals and small letters. Screen capacity, generally 16 to 20 lines, requires the text to be handled in segments; this, however, should not necessarily be classified as a limitation.

Considerably more of a problem than input is the output of edited text because a printing composition layout can still not be produced with the output devices generally available. One present solution is to output a tape to control photo composition or typesetting. The GDR printing industry uses this method, for example, the ASES software system.

Another problem, which however can be resolved in general with satisfaction, is the different number of characters and the different code assignments for both input and output devices.

Moreover, to produce text in typeset quality, a large amount of control information is required. That underscores on the other hand the requirement for a text processing system to be based on a unified language concept, whereby uniformity must absolutely be observed also for the application on small hardware and large computers.

For further development of existing text processing systems, the following requirements among others can be specified:

Hardware Requirements

--compatibility of automated text hardware with data processing hardware
--direct connection of automated text hardware with data processing hardware to enable execution on or off line as required
--printer output in appropriate quality.

The paramount issues here are the character set, capital and small letters and printer speed (350 lines/minute).

Systems Engineering Requirements

--data bank system which affords efficient operation with text files and segments and at the same time storage and processing of larger amounts of text
--linking of machine text systems.

The systems engineering requirements lead to the detailed requirements for a text data bank system. In particular, primarily the following functions should be implemented:
--capability of storing text in subdivided modules
--optional call up of individual text modules at any time
--if necessary, the ability to determine text modules to be processed by a problem program (for example, linking the processing flows -- elements and groups -- with documentation modules)
--capability of inserting special character strings for further processing of edited text (for example, for photo composition or typesetting).

Text Processing Based on the Unified Computer System, Series I

At first, the operating system for the Unified Computer System, Series I, allowed no terminal operation. Thus, the software too in general was written for batch operation. With that, users naturally took advantage of multiprocessing and random access to direct access storage devices. A program for machine processing of text data (MATEX) was developed on the basis of this systems and hardware technology. The basic functions of a text manipulator and text processor are implemented in this program.

The result of machine processing is the edited output of internally stored text data, after corrections have been made. Editing of data to be output refers to the format and is dependent on the data medium to which the data are to be output. It is possible to select only parts of a stored text file to and to establish the page numbers.

Machine Storage of Text Data

Text data acquired in different code on machine readable data media are translated into the unified internal code by using software system input routines and stored intermediately in sequential files for further processing. The work with the intermediate data medium is organized so that the stored files can be updated. The text data are read in from the intermediate data medium and transferred in text files to a data medium with direct access. In the process, text files are organized so that an individual word can be accessed.

Changes to Machine Stored Text Data

To enable changing text data stored on data media with direct access, the following change functions have been implemented in the software system:

Text Correction
An erroneous word can be replaced by one or more words.
Text Insertion
Text of any length can be inserted in any position in the stored text file.
Text Deletion
Text can be deleted at any position in a text file.

The changes always refer to the current status of the text file which is shown in the manuscript.

The modular program structure of the MATEX system enables expansions for special output data media or hardware as required. For example, special text files could appropriately be output to a screen. The software system operates under control of the YeS OS operating system in a partition of a maximum of 100K bytes. For this, a YeS 1040 or YeS 1022 with at least 256K bytes of main storage and at least these peripherals is required:
--perforated tape station
--perforated card reader
--high-speed printer
--inquiry unit
--one magnetic tape unit
--moving head disk for the software system and the text files.

Program run time is dependent on length of text files to be processed and number of changes. The costs for machine time and data acquisition are below those for manual processing when several changes have to be made.

Text Processing Based on the Unified Computer System, Series II

The systems supporting the Unified Computer System, Series II, offer the capability of processing in the batch and interactive modes. Better resource usage raises the efficiency of program processing.

The TEPROS text processing system offers the capability of using Unified Computer System EDP hardware and systems for machine processing of text data. Servicing the TEPROS text processing system can be controlled to allow output of edited and formatted text data to different data media. Texts can either be output by using the high-speed printer connected or displayed in edited form on the screen. Edited text files can also be stored on a data medium with direct access. Other output forms are also possible for special applications, for example, output to magnetic tape or microfiche.

Using video terminals to acquire text data is appropriate. The video terminals now available generally display text in capitals and small letters. Screen capacity requires the text to be handled in segments; this, however, should not necessarily be classified as a limitation. Text can be input continuously with consideration of input area capacity.

In addition to direct input in the interactive mode, text data can be acquired by using the so-called small hardware in the off-line mode. The Programming

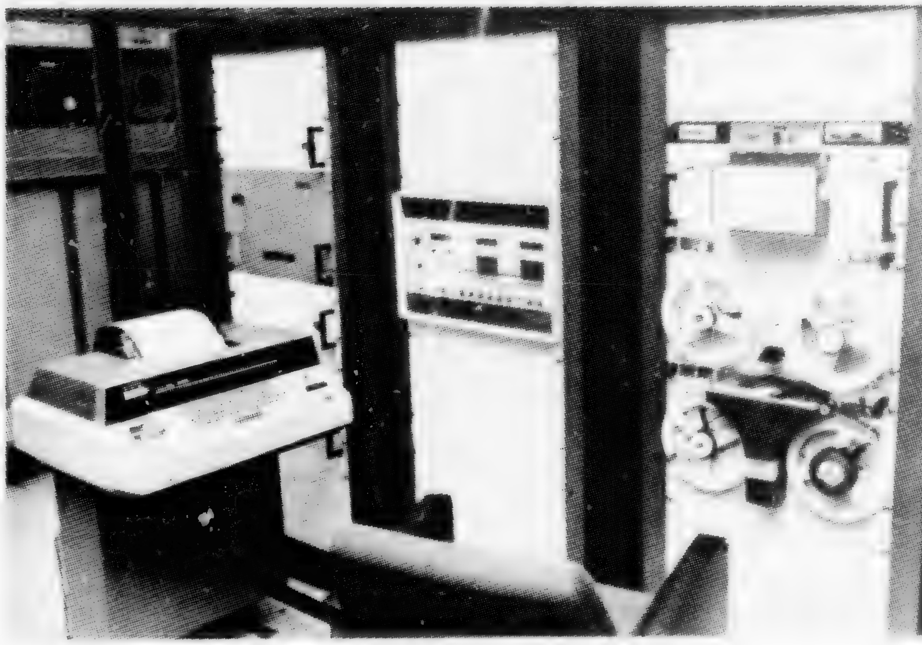

Fig. 2. The Hungarian YeS 1010 Unified System computer processes, among other things, data of molecular structures at the Central Institute for Molecular Biology in Berlin-Buch. In the interactive mode, the data can be output as printed listings, graphic representations or drawings of molecules.

and Test System (PTS) editor function can be used for one to create, insert, change, correct and expand text files in the interactive mode. For another, the TSO offers the capability of acquiring and manipulating text data in the interactive mode. For the batch mode, the Planning, Design and Programming Support Environment (PSU) offers an efficient tool for editing text files.

The correction functions of the editor program which can be executed by simple commands are essentially:
--text file creation
--text error correction
--character, line and paragraph deletion
--character string replacement by another
--character or string search in a file
--character, text and file insertion into an existing file.

Knowledge of a few control program (CP) and PTS commands is required to control text entry and processing with TEPROS in the interactive mode. In addition to storing text files on data media with direct access, a copy of the file can also be made on magnetic tape. The text processing system also offers in the interactive mode the capability of interrupting current processing of a text file and executing PTS commands. This method of operation allows for inclusion of files stored on other media in the processing and for space-saving operation with the direct access storage device.

Special TEPROS commands allow extensive text formatting. Standard assumptions are made in TEPROS to enable executing satisfactory text processing also with a few commands at least for simple requirements.

TEPROS is used in the interactive mode from the display screen. Interaction is implemented with the control program (CP), the programming and test system (PTS) of SVM/YeS and with the TSO component of the OS/YeS 6.14 MVT operating system.

Text processing in SVM/YeS is possible only with virtual machines. These are managed and controlled by CP and PTS. Thus, some knowledge of CP and PTS commands is required to use TEPROS in SVM/YeS. When TSO is used, some knowledge of TSO commands is likewise required.

TEPROS commands offer the capability of putting text into a certain standard form. This form corresponds to the rules for producing machine-written documentation. It is up to the user to select a quite simple form of text processing in which only a fixed margin and page length are allowed for or to choose complex forms such as table processing, or use of head- and foot-notes, and headers and trailers.

Additional Auxiliary Routines

The different types of hardware for the acquisition in both on- and off-line modes and for the generation of readable documents require the development of standalone utilities. The main functions of these programs are data format conversions and recoding of text data. These utilities also form the link between the different text processing systems (for example, between MATEX and TEPROS).

To use hardware subordinated to the data processing process such as, for example, that for microfilm output, photo composition or typesetting, special solutions have to be elaborated. An acquisition and conversion program has been developed for the Robotron 1372 and Robotron 1250 hardware for off-line text acquisition of text data to be processed by TEPROS.

PHOTO CAPTION

1. p. 13. Data entered in the interactive mode into large Unified System computers can be checked and corrected on a terminal screen. The text data acquired can be processed further in the batch or interactive modes.

8545
CSO: 2302/25

PRODUCTION OF MINI, MICROCOMPUTERS IN ROMANIA

Budapest SZAMITASTECHNIKA in Hungarian Mar 84 p 5

[Article by Dr Peter Broczko]

[Text] Although Romania is our neighbor, we still know very little about its computer manufacturing industry. One of the reasons may be that Romania participates only through the production of peripherals in the ESZR cooperation of socialist nations. It is all the more active, however, in the production of machines compatible with mini- and microcomputers produced in socialist countries.

The manufacturing of computers in Romania is combined under the Electronics and Computer Technology Industrial Center (CIETC) and the Teleprocessing Devices Industrial Center (CIETA), both subordinated to the Ministry of Electromechanics and Electronics. These institutions, similar to our trusts, directly supervise the large variety of companies involved with computer technology. The most important companies belonging to CIETC are: ITC Computer Technology Research Institute, ICE Computer Manufacturing Factory, FEPER Peripheral Manufacturer and Elektronum Foreign Trade Enterprise. As a special point of interest, the latter is supervised by the Romanian Ministry of Foreign Trade.

Let us visit the most important Romanian computer technology institutions. The ITC Computer Technology Research Institute is involved with the design of computers and the preparation of software. It has over 1,500 employees in three cities: Bucharest, Cluj and Timisoara. Among the latest achievements of the institute, we must mention the Felix 8010 large computer (with 4 Mbytes of operational memory), the independent 102 minicomputer, which is the Romanian equivalent of the SZM-4. In the area of software development, we are only mentioning those compatible with the PDP family: RDOS-RV and MININET RMOS-RV operating systems, PIX interactive system for the design of printed circuits, CADIX interactive system for the preparation of engineering drawings, ARTIS interactive system for design in the building industry.

The ICE computer manufacturing company was established in 1972; at the beginning, it was involved with the manufacturing of computers based on foreign license. Today most of the computers they manufacture are designed in Romania (e.g., those developed by ITC) and gradually COMECON integration is gaining ground. From our country MOM is supplying them with thousands of floppy disks,

punched tape readers and tape punches. Today they have 2,000 employees already, 42 percent of them women, and the average age in the factory is only 30 years. Among their more important products are the Felix-family large computers: the PDP compatible I-102 F and the more advanced Coral-family minicomputers; the FC 1000 office microcomputer, which was exhibited at the last year Budapest International Fair and is, for the time being, without a microprocesssor; the M18 and M18B general-purpose microcomputer, based on the socialist equivalent of the INTEL 8080, and their desk-top equivalent, the M-113, which is, among other applications, produced for educational purposes. The production volume is also significant. In 1983, 40 large computers, 600 minicomputers and 800 microcomputers were manufactured.

They are currently involved in the design of a microprogrammed large computer, which will be compatible with any computer by a replacement of the microprograms. This is expected to appear in 1985.

The products of ICE factory are also popular abroad. Approximately 30 percent of their products are exported, 7 percent to Western countries.

The FEPER Peripherals Manufacturer was originally established for the production of peripherals, and in the beginning the factory was producing a few products coinciding with its profile. As a result of the rapid development of microelectronics, in 1981 the factory fundamentally changed its product line, its nomenclature expanded, the number of pieces produced was reduced and the product life expectancy lowered to 1-3 years. Now the production of 15 new products is initiated and production value is increased by 50 percent annually.

Following are the currently manufactured most important products:

-- slow peripherals: matrix, heat and line printers, punched tape readers, tape punches and keyboards;

-- fast peripherals: floppy disk storage, magnetic tape storage and cassette tape storage;

-- CRT displays: four models manufactured according to the international standards; liquid crystal displays are also produced;

-- intelligent terminals: TDF terminal based on the INTEL 8080 and SIDM group data recorder based on the I-102F machine and compatible with PDP;

-- graphics microcomputers: Diagram-family, which currently has three members and is expected to have ten by next year.

From among the products mentioned, the 1600-bpi density magnetic tape storage device and the Diagram graphics microcomputer family stand out because of the high level of technology. The products of the FEPER factory are in great demand in Romania. Demand exceeds production capabilities three times.

Together with the American CDC company, the ROM-CONTROL-DATA (RCD) enterprise was established in 1974, with a 50-50 percent capital investment. Its products

are manufactured based on CDC design and technology. Its primary products are peripherals: line printers, card readers, 1600-bpi density magnetic storage devices, and 50 and 60 Mbyte magnetic disk units. For us this latter is the most important, since, at the 1983 Leipzig Fair, Videoton exhibited the SZM-52 minicomputer with the same disk drive.

From Western cooperation, we must mention the joint effort with the West German Aristo Company in the area of graphic data processing.

The main thrust of IPA's design effort involves data transmission devices, e.g. radio and optical modems, but the TELEPROM P intelligent terminal is also among its products.

The exchange of goods between Romania and our country is picking up. The bilateral permanent computer technology task group is scheduled to meet as frequently as twice a year.

Our most important export to them are floppy disk storage devices, punched tape readers and tape punches produced by MOM, but the cooperation with IGV in the area of cash register manufacture must also be mentioned.

In the last few years, in exchange for our export, we purchased only a few Felix computers, and we are buying only bookkeeping and billing machines on a regular basis.

The computer product line of Romania is surprisingly rich, especially in microcomputers. We should pay more attention to what they have to offer and to making their products more widely known and popular in our country.

Mini and microcomputers produced in Romania

(1) Kategória	(2) Típus	(3) Megnevezés	(4) A mikroprocesszor típusa	(5) Operatív tárméret (kbájt)	(6) A megjelenés éve	(7) Gyártó cég
(8) Univerzális mikrogépek és intelligens terminálok	CORAL 4001A	kisszámítógép (9)	4 db AMD 2901 (10)	64	1983	ICE
	FELIX M 18	mikroszámítógép (11)	Intel 8080	64	1982	ICE
	FELIX M 18B	mikroszámítógép (12)	Intel 8080	64	1982	ICE
	FELIX MC 8	mikroszámítógép (13)	Intel 8080	48	1981	ICE
	FELIX M 118	asztali mikroszámítógép (14)	Intel 8080	16	1982	ICE
	FELIX CUB	mikroszámítógép (15)	Intel 8080A	64	1983	ICE
	TDF	intelligens terminál (16)	Intel 8080	16—48	1982	FEPER
	TELEROM P	intelligens terminál (17)	Intel 8080	16—56	1982	IPAR+IEIA
	FC 1000	irodai mikroszámítógép (18)	—	8	1983	ICE
Szövegfeldolgozó (19)	DAF 2010 T	szövegszerkesztő mikroszámítógép-rendszer (20)	Intel 8080	48—64	1982	FEPER
(21) Grafikus	DIAGRAM	párbeszédes színes grafikus család (1983:3 tag, 1984:10 tag) (22)	3 db Z80 (26)	2048	1982	FEPER
Adatelőkészítő	SIDM	I—100 alapú csoportos adatrögzítő (23)	—	64—256	1982	FEPER
(27) Egyéb célgépek	CEN—86	hajózási mikroszámítógép (24)	Intel 8080	48	1982	IPA
	MISAF	információs táblakezelő mikroszámítógép (25)	Intel 4040	1	1982	ITC
	CORDIROM 3C	háromdimenziós méréseket végző mikroszámítógép (28)	..	1	1982	ITC
	DEPD—01	vagonok mozgás közbeni mérésére szolgáló mikrogép (29)	Intel 4040	1	1982	ITC
	PROM—1000 A	a PROM típusú tárak programozására szolgáló mikrogép (30)	..	..	1982	ITC
	MISTRIR—01	kötógépeket vezérlő mikroszámítógép (31)	Intel 8080	36	1982	ITC
	AP—8	8 bites mikroprocesszor-elemző (32)		..	1982	ITC
	SECOL 80	jelenlét-nyilvántartó mikroszámítógép (33)	Intel 8080	36	1982	ITC
	I—100	miniszámítógép (a PDP 11/34 funkcionális megfelelője) (34)	—	64—256	1980	ICE
	I—102 F	miniszámítógép (a PDP 11/45 és 11/60 közötti) (35)	—	1024	1982	ICE
	CORAL 4011 A	miniszámítógép (a PDP 11/34 funkcionális megfelelője) (36)	8 db AMD 2901 (37)	256	1983	ICE
	CORAL 4021	megamini (a PDP 11/45 és 11/60 közötti) (38)	8 db AMD 2901 (39)	4096	1983	ICE
	CORAL 4030	megamini (a PDP 11/45 és 11/60 közötti) (40)	6 db AMD 2901 (41)	4096	1983	ICE

Note: In the microprocessor type column, the functionally original has been inserted for Intel and Zilog microprocessors, in practice, only their socialist equivalents are built in. The only difference between the independent family (I-100 and I-102) and the CORAL family is that the latter has a more advanced design. Practically, the only difference between the CORAL 4021 and 4030 is that the 4021 has a floating point processor.

Key:
1. Category
2. Type
3. Description
4. Microprocessor type
5. Operative storage size
6. Year first approved
7. Manufacturer

[Key continued on following page]

8. Universal microcomputers and intelligent terminals
9. Minicomputer
10. 4 AMD 2901s
11. Microcomputer
12. Microcomputer
13. Microcomputer
14. Desk top microcomputer
15. Microcomputer
16. Intelligent terminal
17. Intelligent terminal
18. Office microcomputer
19. Word processor
20. Word processor microcomputer system
21. Graphic data preprocessor
22. Interactive color graphics family (1983: 3 members, 1984: 10 members)
23. I-10 based group data recorder
24. Shipping microcomputer
25. Information table processor microcomputer
26. 3 Z80s
27. Other machines tasked
28. Microcomputer for three-dimensional measurements
29. Microcomputer for the measurement of railroad cars in motion
30. Microcomputer for the programming of PROM memories
31. Microcomputer for the control of knitting machines
32. 8-bit microprocessor analyzer
33. Presence register microcomputer
34. Minicomputer (equivalent of the PDP 11/34)
35. Minicomputer (between the PDP 11/45 and 11/60)
36. Minicomputer (the functional equivalent of the PDP 11/34)
37. 8 AMD 2901s
38. Megamini (between the PDP 11/45 and 11/60)
39. 8 AMD 2901s
40. Megamini (between the PDP 11/45 and 11/60)
41. 8 AMD 2901s

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COMPUTER RESOURCES OF PHYSICS INSTITUTE FOR 1980'S

Budapest MERES ES AUTOMATIKA in Hungarian No 2, 1984 pp 41-43

[Article by Peter Forro, Central Physics Research Institute, Budapest, 29-31 Konkoly Thege St: "The Computer Technology Resource Base for the 1980's at the KFKI"; received for publication 5 Dec 83]

[Text] In 1968 domestic professional public was introduced to the first first minicomputer of the KFKI [Central Physics Research Institute], a 12-bit word length, transistorized second generation minicomputer with 4 K words of operating memory--the TPA-1001.

This was a rather high-level technical achievement at the time and while it did not completely satisfy the needs of domestic users it did make possible the solution of a number of applications tasks. Then new technologies appeared, the integrated circuits, and the spread of drilled, metallized printed circuit cards also had an effect on our design principles.

The TPA Computer Family

The TPA-i appeared, followed by the TPA-s. We always considered software compatibility a primary requirement. The first TPA family, the TPA-8, was developed. Several hundred of these machines aided the spread of domestic computer technology and the satisfaction of user needs. By 1977, we had developed our first 16-bit computer compatible with the MSZR [minicomputer technology system] machines, the TPA-1140. This gave birth to the TPA-11 family, which since then has reaped ever greater successes among users, primarily thanks to its flexible hardware design and broad software supply.

Beginning even in the 1950's a staff of electronic experts was accumulating more and more experience in the area of measurement technology.

With the development of multichannel analyzers we turned significant resources to the development of real-time peripheral control system modules, using the internationally standardized CAMAC, outstandingly suitable for measurement data collection and to the development of their intelligent subsystems.

Our most significant applications areas developed on this fundamental device base. These areas are industrial and laboratory measurement data collection and business mechanization.

In the 1970's we successfully put into operation several hundred TPA systems. To mention just a few of our largest users and their projects:

--modernization of the national financial information system for the PM [Ministry of Finance];

--modernization of the national statistical information system, for the KSH [Central Statistics Office];

--mechanization of the record-keeping and accounting tasks of electric power enterprises and an on-line guidance system for guiding and supervising electric power distribution technologies, for the EMASZ [Northern Hungary Electric Power Enterprise] and the DEMASZ [Southern Hungary Electric Power Enterprise];

--model systems for construction industry planning, for construction industry planning enterprises; and

--measurement data collection systems for the power plant blocks of domestic thermal power plants, for the ERBE [Electric Power Plant Investment Enterprise].

The quantitative and qualitative demands being made of minicomputers have constantly increased; primarily, the capacity of the operating memory proved too small for certain users. This, primarily, made necessary the development of our TPA-1148 computer. Basically this was not a new design, but the operating memory, developed on a fully developed hardware base which could be expanded to 4 M bytes, the increased number of work registers and the microprocessor-based intelligent console meant real extra performance for the users. We might emphasize that when developing this megamini machine it was an important consideration for us that the extra possibilities be attainable easily and relatively cheaply for those who already had a TPA-1140 computer also. Thus far we have made the appropriate changes for more than 40 users, making it possible for them to use a substantially more powerful operating system than before. Our TPA-11/440 computer which appeared in 1983 on new foundations also represents the megamini category.

Design Changes

This meant an entirely new design, compared to the foregoing, maintaining such essential properties of the family as software compatibility from above and the full utilizability of previously developed and used peripherals and peripheral controls. The expanded instructions set and the 32-bit internal architecture ensured the possibility of the practical realization of our developmental ideas which may lead toward a 32-bit gigamini computer. This category, in our opinion, may appear in the second half of the 1980's, coinciding with the expected growth of domestic needs at the time.

Until then we will be working with significant resources on clarifying basic developmental questions, the most essential of which is the technology to be used, but the parts assortment and mechanical system and even the correct selection of system software are important also.

In the meantime, however, development of the TPA-8 family has not stopped. Versions based on microprocessors have appeared--the TPA-L/32, the TPA-L/128 and the TPA-L/128H. The latter are our most modern models in this category, achieving a significant increase in processing speed and operating memory capacity compared to the preceding models of the family.

Recently throughout the world, and thus in Hungary also, personal computers have conquered more and more areas. Making use of our computer technology experiences thus far, we felt that we could not ignore this category, more precisely the professional size segment of the category.

The TPA-Janus has appeared as the smallest member of the TPA-11 family. One face of it is a system based on a single-card 16-bit Soviet microcomputer while the other is a popular and widely used 8-bit processor to handle the CP/M operating system. Very good cooperation developed in this area between the KFKI and the Electronics Industry Ministry of the Soviet Union.

A professional personal computer in the TPA-8 family was developed also, under the name TPA-Quadro.

In addition to the operating systems widely used on 12-bit machines, this also is suitable for CP/M. We think that the personal computers developed by us (TPA-Janus and TPA-Quadro), with their extraordinarily broad software supply, may represent more for the users as compared to other personal computers and that connected to existing TPA systems and with one another one can develop from them high performance networks.

Our software activity also is placing greater emphasis than before on the development of high-speed local nets and new communication program systems. We would like to turn our existing software capacity to the development of programs and program systems pointing in our chief applications directions.

The KFKI always considered it important to hand over its developmental achievements suitable for small series manufacture as soon as possible for manufacture by some industrial enterprise or industrial cooperative. We think that these developmental achievements can become, quantitatively and qualitatively, products at the level needed by our economy only in these places. In the future also we will strive to have the developmental phase or the testing and integration phase of computer applications systems take place at the KFKI, but reproduction, the activity not requiring a research institute environment, should take place in industry.

Products, Manufacture

Here are a few examples of products handed over in recent years:

[See list, next page]

Name	Description	Receiver
TPA-70	minicomputer	VILATI [Electric Automation Institute]
CAMAC	system	MMG [Mechanical Measuring Instruments Factory]
TPA-s	minicomputer	Servintern, ISZ
TPA-L/32	minicomputer	Signal Technology, ISZ
UMDS	microprocessor development system	EMG [Electronic Measuring Instruments Factory]
MSX	magnetic tape unit	ORION
TPA-1140		SZKUBT [Computer Technology Experimental Plant Stock Association]
TPA-1148		SZKUBT
TPA-11/440		SZKUBT
UDT	universal display terminal	ORION

Naturally these transfers are not free of hitches, and are not always successful. Sometimes the takeovers go slowly, and it also happens that the takeover does not lead to the runup of the product but rather to its obsolescence and expiration. But despite the difficulties, the balance in recent years has been positive in regard to beginning manufacture.

A qualitatively different situation has developed with the SZKUBT. This firm is the joint developmental enterprise of VIDEOTON, the SZKI [Computer Technology Coordination Institute] and the KFKI, and it has been working since 1980. The quantity and quality of the products taken over by it best approach the level which we had imagined. With this form, the interest relationships are probably more favorable and for this reason the association is fulfilling its chief function--the efficient and high-level industrial realization of the results of research and development [R&D]. This suggests to us that in the area of research-development-manufacture-system integration we should seek a solution in these directions in the future also.

(Peter Forro has worked at the Measurement and Computer Technology Research Institute of the KFKI since 1968 when he graduated from the Electrical Engineering School of the Budapest Technical University. In the beginning he dealt with development of the TPA minicomputers; following this he played a great role in organizing experimental plant production of the computer technology devices of the KFKI. From 1980 to 1982 he was active as technical deputy director of the Computer Technology Experimental Plant Stock Association founded at that time. Since his return to the KFKI he has joined with all his energy in leadership and guidance of the MSZKI [Measurement and Computer Technology Research Institute]. He is coauthor of a number of patents and has been awarded the bronze and gold degree of the Outstanding Inventor decoration.)

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TPA MEGAMINI SERIES DESCRIBED

Budapest MERES ES AUTOMATIKA in Hungarian No 2, 1984 pp 44-47

[Article by Pal Endrody and Geza Lorincze, of the Central Physics Research Institute: "The TPA-11 Megamini"; received for publication 24 Nov 83]

[Text] The swift increase in user needs made necessary a further development of the TPA-11 minicomputer family in the direction of greater performance.

Building on the architecture of the TPA-1140 and supplemented with a new memory-segmenting unit, the TPA-1148 operates with a maximum operating memory of 4 M bytes. A new, microprocessor-based operator's console aids access to the system.

In developing the new type architecture of the TPA-11/440, our fundamental consideration was to satisfy for a longer term and in a broader spectrum the user demands expected to be made in regard to the TPA-11 machines. The TPA-11/440 has 46 new floating-point instructions and 52 new so-called business instructions, by virtue of which it offers greater performance, as compared to existing TPA-11 and MSZR [minicomputer system] minicomputers, in scientific-technical [S&T] calculations (FORTRAN IV PLUS) or business applications (COBOL).

The DOS-RV (RSX-11M), DOS-RV-PLUS (RSX-11M PLUS) and UNIX operating systems are effective for advantageous exploitation of the possibilities offered by the increased memory area of expanded instruction system of the TPA-1148 and TPA-11/440 megaminis.

The development of an applications experiences with the TPA-1140 made possible the creation of two new types--the TPA-1148 and the TPA-11/440--which in turn represent a bridge toward devices of even greater capacity.

In the course of the past half decade, the TPA-1140 minicomputers have appeared in virtually every branch of the economy. The broad assortment of peripherals and the extensive software made it possible to use them well in business organization, computer data processing, process control, measurement and data collection and S&T calculations alike. The first TPA-1140 configuration with 32 K words of ferrite ring operating memory was soon followed by systems with 128 K words of semiconductor memory. Despite

memory area four times as large, the continous collection and analysis of applications experiences showed a few bottlenecks which can be easilty outlined:

1. In a multiuser environment only 5-6 tasks running in parallel use up entirely the maximum 128 K words of operating memory area.

2. The maximum of 32 K words of virtual memory proved too little for larger size programs (for example, tasks of a CAD character).

3. The operator's console realized with switches can be called poor.

4. There is an increasing number of users for whom the lack of a floating-point processor and decimal arithmetic represent an ever greater problem.

5. Due to demands pointing in the direction of a larger memory area, the use of an error-correction code ensuring greater reliability is coming into the foreground.

6. In the long run, the ever greater number of peripherals in use will require 32-bit memory data traffic.

On the basis of an analysis of the bottlenecks and of applications trends it became certain even at the very beginning of the 1980's that a swift further development of the TPA-1140 was necessary. We regarded it as an absolute requirement that the newer TPA-11 machines should be fully compatible from above with earlier systems, making possible the running of existing user programs without change.

The TPA-1148 CPU

In accordance with the further development strategy for the TPA-11 family, manufacture of the TPA-1148 megamini began at the end of 1982. With relatively little developmental expenditure, it offers the following extra services as compared to the TPA-1140:

--Maximum storage capacity can be expanded from 128 K words to 4 M bytes. Increasing the number of memory-resident programs made it possible to reduce response times and to increase the number of simultaneous tasks.

--In addition to the two operating modes of the TPA-1140 (Kernel, User) there is a third, the Supervisor. In all three modes, the programs have a separate transformation register set.

--Instructions and data can be stored separately in memory (I space and D space).

--The number of general registers increases from 8 to 16.

--There are three new control instructions (MPFD, MTPD and SPL) and a programmable interrupt query (PIR).

--Cache memory.

--There is 22-bit mapping of UBUS addresses.

--Self-diagnostics.

--The well known front panel of the TPA-1140 mini, consisting of "lamps and switches," is replaced by an intelligent operator's console based on a Z80 microprocessor which interprets ASCII characters and at the same time realizes the TPA-1140 program loading connection and an asynchronous line connection. Going beyond the development of a high-level man-machine link, the intelligent operator's console also provides a number of functions which aid in tracking programs.

In the course of creating the TPA-1148, we regarded it as very important that the TPA-1140 users should be able to transform their systems into TPA-1148's at relatively little material expense. Naturally the TPA--1148 is software compatible with the TPA-1140.

(Design of the 1148 FPP floating-point processor began and was completed since the article went to press.)

A Brief Description of the Operation of the TPA-1148 System

The central unit delivers 16-bit address and data lines. It is the task of the memory organization unit to divide the address lines into two. It produces the 18-bit address lines of the UBUS (BUS A[17:00]) and the 22-bit address lines of the memory bus system (PA[21:06]+VBA[05:00]) (Figure 1).

The task of the MAP unit is also a dual one:

--it selects between the address lines of the UBUS and the 22-bit address lines coming from the memory-organization unit, and

--it produces--in the event of authorization--the 22-bit address domain (memory bus) from the 18-bit address domain of the UBUS.

The designations in the figure are:

CPU--central unit

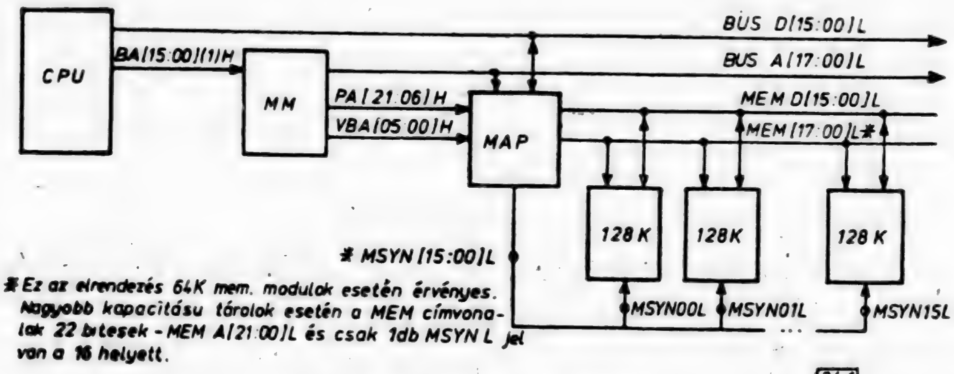
MM--memory-organization unit

BA--bus address line

PA--physical addresses

MSYN--master synchronization (control signals).

The structure of the central unit coincides with that of the TPA-1140 central unit. For transformation one requires two memory-organization cards, one MAP card and one intelligent-console card.



1. ábra. TPA—1148 elvi felépítése

Figure 1. Basic Architecture of TPA-1148.

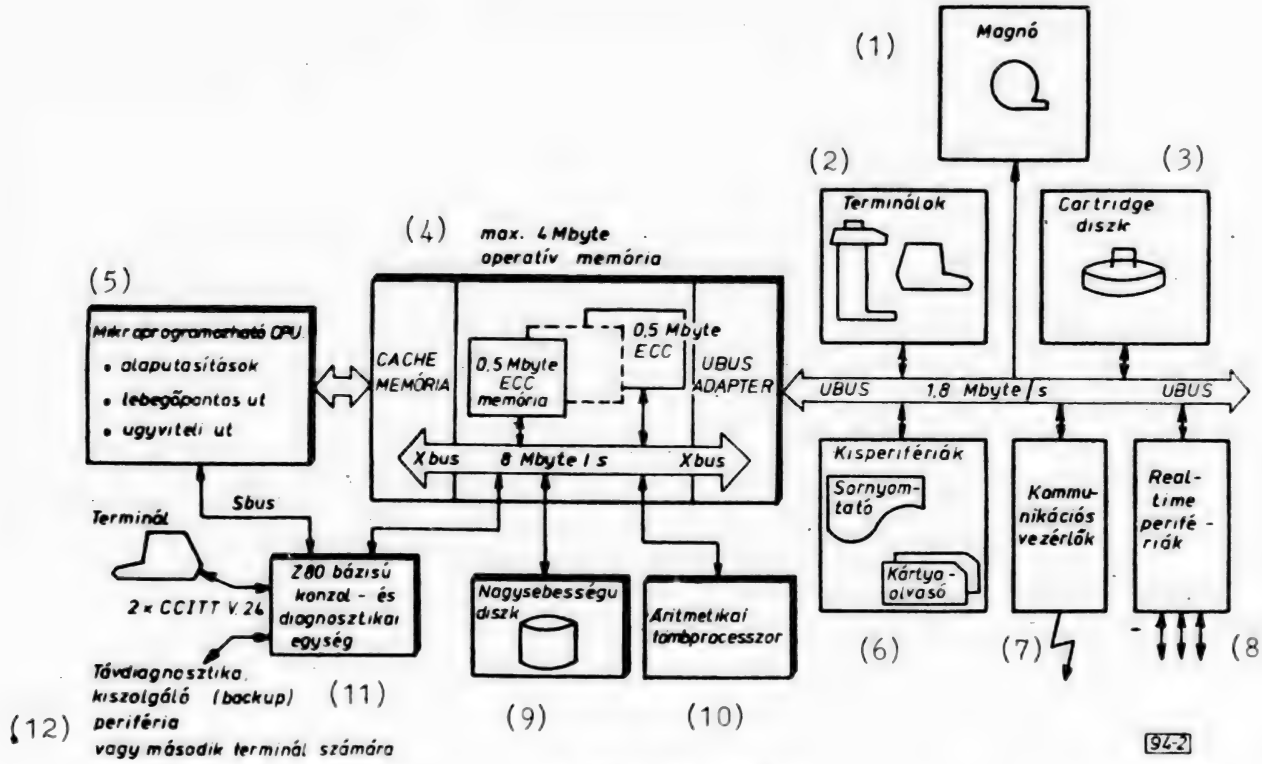
Note: This arrangement is valid in the case of 64 K memory modules. In the case of larger capacity stores the MEM address lines have 22 bits--MEM A(21:00)L and only one MYSN L--instead of 16.

TPA-11/440 Diagrammatic Structure

Creation of the TPA-11/440 megamini computer began in 1981 as the next step in the further development of the TPA-11 minicomputer family. With its 32-bit architecture, expanded instruction set and modular construction, using a modern element base and easily expanded, the TPA-11/440 will be suitable for satisfying applications needs for a longer time and in a broader spectrum. Although the TPA-11/440--like the other members of the TPA-11 family--is a general-purpose megamini it is especially recommended for a multiuser environment, for business systems and for large data laboratory and process control real-time or S&T applications.

The TPA-11/440 is completely instruction-compatible from above with existing TPA-11 and MSZR machines.

The UBUS peripheral connection possibility, well known in the TPA-11 family, is available with the TPA-11/440 also, thus all the connectors developed earlier can be used. The ever cheaper LSI circuits carrying out ever more functions and the ever larger capacity semiconductor memory chips make it possible, and user needs certainly justify it, for the TPA-11/440 to realize in a standard way an unaccustomed number of functions compared to earlier minicomputers. This design philosophy results in a more favorable price/performance factor and makes possible more reliable operation. The architecture of the TPA-11/440 can be seen in Figure 2.



2. ábra. TPA–11/440

Figure 2. Architecture of TPA-11/440

Key:

1. Tape recorder
2. Terminals
3. Cartridge disk
4. Max. 4-Mbyte operating memory
5. Microprogrammable CPU: Basic instructions; floating-point instructions; business instructions
6. Small peripherals: Line printer; card reader
7. Communications controls
8. Real-time peripherals
9. High-speed disk
10. Arithmetic block processor
11. Z80-based console and diagnostic unit
12. Remote diagnostics, backup for peripheral or second terminal

Standard Functions in the TPA-11/440 computer:

--three processor modes: Kernel, Supervisor, User;
--separate instruction and data area (I and D space);
--four new control instructions (MFPD, MTPD, SPL, CSM);
--46 new floating-point arithmetic instructions (FP11);
--memory segmentation and protection;
--cache memory;
--a 32-bit internal synchronous bus with a throughput of 8 M bytes per second to accelerate memory traffic and for efficient connection of high-speed background stores and special function processors;

--a 0.5-M byte memory in the basic configuration with error correction code (ECC);
--22-bit mapping of UBUS addresses;
--intelligent ASCII console, self-diagnostics;
--two serial line terminals, or one terminal and one V.24 compatible backup for connecting peripherals;
--loading program (bootstrap loader).

Options in the TPA-11/441 Computer:

--instructions to handle 52 new character chains and decimal arithmetic instructions (CIS);
--memory which can be expanded in 0.5-M byte increments (with upper limit of 4 M bytes);
--parity protected memory which can be expanded in M byte increments (with upper limit of 4 M bytes);
--battery backup to preserve semiconductor memory content when net voltage fails;
--remote diagnostics via serial line;
--definition of special instructions for direct microprogrammed, very efficient execution of complex algorithms.

Instruction Set

Going beyond the instruction set known for the TPA-11 and MSZR machines the TPA-11/440 contains, in the standard mode, 46 new floating-point instructions which make the numeric data handling of the machine many times more efficient. In this way--thanks to the TPA--11/440--one can cover better with the TPA-11 family such applications areas, less supported earlier, as S&T calculations, interactive graphic systems and larger data industrial process control and laboratory and medical real-time processing.

The FORTRAN IV-PLUS compiler--a further developed version of FORTRAN IV--presumes the FP11 compatible floating-point instructions and, by virtue of its use, processing which handles numeric data and requires a large number of operations becomes substantially faster, and at the same time requires less memory area.

The chief characteristics of the floating-point instruction package are:

--a simple (32-bit) and double (64-bit) precision operating mode;
--8 digit precision in the 32-bit mode and 17-digit precision in the 64-bit mode;
--flexible addressing modes, six 64-bit floating-point registers;
--arithmetic error handling.

It is ever more frequently expected of modern minicomputers that they also have the capacity to handle large amounts of data in business applications. For the first time in the TPA-11 family, the TPA-11/440 offers 52 new special data handling instructions, as an option, by expanding the microcode.

The so-called business instruction set (CIS) contains the following most essential functions:

--decimal arithmetic;
--character string handling;
--data format conversion.

The CIS instructions make the running of COBOL especially fast and efficient. With the CIS instructions, the TPA-11/440 supports data base management and business applications more strongly.

Architecture

When developing the architecture of the TPA-11/440 we took two viewpoints into consideration in a fundamental way:

--the TPA-11/440 should be suitable for satisfying the user needs to be expected in the middle and second half of the 1980's;
--the architecture and data transmission capacity of the TPA-11/440 should provide a possibility for further development in the direction of devices with a 32-bit instruction set.

For this reason, the backbone of the TPA-11/440 architecture is an internal system bus--the X bus--with a data width of 32 bits and a throughput 4 to 5 times greater than that of the UBUS (Figure 2) with the following essential parameters:

--data width, 32 bits;
--maximum addressable domain, 16 M bytes/24 bits (at present the TPA-11/440 uses only 4 M bytes);
--125 ns cycle time synchronous control;
--so-called distributed assignment (arbitration) in the interest of easier diagnostics;
--the distributed assignment makes possible the use of parallel processors;
--32-bit reading/500 ns (8 M bytes/s);
--32-bit writing/250 ns (16 M bytes/s);
--number of program interrupt levels, 4;
--number of devices which can be connected to the X bus, max. 16;
--X bus access (latency) time, min. zero, max. 125 ns, if a higher level query does not arrive at the moment of the query.

The X bus brings together the higher speed elements of the system more demanding of data:

--the 0.5 M byte ECC memory modules;
--the central unit via cache memory;
--the UBUS adapter, which produces the UBUS protocol and carries out the UBUS-memory address mapping;
--high-speed background stores, and
--special function processors.

Connecting the higher speed background stores to the X bus has two definite advantages compared to a UBUS connection:

--32-bit data transmission;
--direct 22-bit--Massbus type--addressing by avoiding UBUS address mapping.

(Since the article went to press, the design of the so-called expanding UBUS adapter has been completed; with the aid of this the high-speed background stores can be connected to the TPA-11/440 more efficiently than before.)

The Z80 microprocessor-based console and diagnostic unit is connected to the X bus also, primarily for system access and diagnostic purposes. The registers of the central unit and the microprogram store can be accessed via the 16-bit S bus. A large number of efficient, programmed console commands ensures access to the several elements of the system from the terminal.

To accelerate data traffic between the central unit and memory the TPA-11/440 uses a cache memory with a capacity of 16 K bytes; in 90 to 95 percent of the read cycles this provides the requested data to the central unit with a very short access time. The cache memory--in addition to accelerating the execution of instructions--improves the data traffic capacity of the system in that a significant proportion of the cycles initiated by the CPU do not require bus data transmission.

The memory modules, with a capacity of 0.5 bytes each and a cycle time of 500 ns and which can be interleaved two at a time, have a data organization of 32 plus 7 bits where the 7 bits provide an error-correction function. This means that if, while reading a 32-bit datum, the check logic detects an error in one bit it is automatically corrected by virtue of the 7-bit code and the corrected data is sent to the requesting unit (CPU or peripherals). In the event of two errors, there is an error indication program interrupt. Use of the 7-bit ECC significantly increases the reliability of the system.

Table 1.

Summary Table of the TPA-11

Service	TPA-1148	TPA-11/440
Processor arithmetic	16 bit	32 bit
Floating-point processor	none	standard
Business instructions	none	optional
Max. memory area	4 M bytes	4 M bytes
Cache memory	optional	standard

Max. memory capacity per card	512 K bytes	512 K bytes (ECC) 1 M byte (parity)
Microprogram store	PROM	PROM RAM (optional)
Out/input data width	16 bit	16/32 bit
Max. bus throughput	1.7 (UBUS)	1.7 (UBUS) 8 (X BUS)
Memory data protection	parity	ECC parity
Number of central unit cards with 512 K bytes operating memory and cache memory	13	8

The RSX-11M, RSX-11M PLUS and UNIX or equivalent operating systems are recommended for advantageous exploitation of the possibilities offered by the architecture and instruction system of the TPA-11/440.

The chief characteristics of the TPA-1148 and TPA-11/440 are summarized in Table 1.

The TPA-11/440 follows the system unit (SU) construction already known for the TPA-11 family. The central unit is based on a microprogrammable AM2900 bit sliced microprocessor. The semiconductor memory matrix is made up of 64-K bit dynamic MOS memory chips. The control logic consists of TTL/Schottky and TTL/Low Power Schottky integrated circuits.

We will return in a separate series of articles to a more detailed description of the several functional units of the TPA-11/440.

(Pal Endrody graduated from the Electrical Engineering School of the Budapest Technical University in 1972. Since then he has been working in the KFKI MSZKI [Measurement and Computer Technology Research Institute of the Central Physics Research Institute] and is now a scientific colleague and theme leader. His chief task at first was development of test programs for the TPA minicomputer system; he then participated in development of the TPA-1140. He began development of the TPA-1148 in 1981 and completed it in September 1982. At present he is dealing with designing a 32-bit minicomputer.)

(Geza Lorincze has been working in the MSZKI as a scientific group chief since 1971. Until 1976 he participated in development of the TPA-70 minicomputer and then in development of the central unit of the TPA-1140. In 1979 he directed a study of the TPA-11 system. At present he is theme leader for development of the TPA-11/440 megamini.)

8984
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TPA-L/128H, LATEST MEMBER OF TPA-8 FAMILY

Budapest MERES ES AUTOMATIKA in Hungarian No 2, 1984 pp 48-51

[Article by Istvan Kovari, Lajos Leveleki and Andras Pataki, of the Central Physics Research Institute: "TPA-L/128H, Latest Member of TPA-8 Family," received for publication 24 Nov 83]

[Text] It is more than 4 years since an article appeared in this journal concerning the first microprocessor-based version of the TPA-8 family, the TPA-L32 minicomputer. Since then, this member of the family practice has proven that it can be manufactured and tested simply and serviced easily. Thanks to outstanding software and a good supply of peripherals it has proved to be a successful product, similar to earlier members of the family. On the basis of a contract between the KFKI [Central Physics Research Institute] and the Signal Technology Cooperative, the Signal Technology Cooperative has manufactured more than 80 machines which the KFKI put into operation, primarily in the area of business mechanization. Thus the number of systems put into operation in the TPA-8 family exceeds 500. The broad field of users, the new requirements, the broad supply of software and the appearance of ever more modern hardware devices since the appearance of the first member of the family in 1968 require that from time to time we raise the hardware and technological level of the machine to a higher level and constantly improve its services. The need to maintain a modern level is justified also by the fact that at the end of 1982 the American firm DEC appeared on the market with a PDP-8-based personal computer (the DEC-Mate II).

Guiding Principles for Development

We grouped our developmental ideas in three chief directions:

--increasing the capacity of the operational memory;
--developing an intelligent terminal with use of existing devices, and
--increasing the operating speed of the machine.

We first increased memory capacity with the TPA-L/128 version (NR 4101B model). We developed this from the TPA-L/32 machine which was in manufacture; it can address a memory of 128 K words and in addition to a memory area 4 times greater it makes possible substantially more flexible memory management.

The result of our efforts to develop an intelligent terminal was the device designated the TPA Terminal I (NR 4104 A and B model), which we will describe separately in our article.

We conducted research in two directions in the interest of increasing the computer technology performance of the machine.

One direction--making use of the possibility of developing the multiprocessor system within the TPA-L--was the development of a general-purpose parallel processor. This is suitable, for example, for parallel running of floating-point operations, Fourier transformations or other user-definable tasks.

The parallel processor also has an IM6100 base, has its own operational memory and a V.24 serial interface. The program for the task to be solved can be burned into EPROM. The parallel processor is connected to the PDT-ADT (Programmed Data Transfer-Autonomous Data Transfer) bus of the TPA-8 family and thus can also be connected to the older members of the family (TPA-i and TPA-s).

The other path to increase speed is to increase the speed of the basic processor. The advertised IM6100 microprocessor working with an 8 MHz clock has not appeared so we conducted the development in the direction of a microprogrammed architecture (results were achieved even earlier in this area at the KFKI).

In the course of our developments, we continued to take seriously instruction- and program-level software compatibility with the members of the PDP-8 American family and the TPA-8 family.

In what follows we will describe briefly the TPA Terminal I and our TPA-L/128H machines.

TPA Terminal I

When developing the intelligent TPA-L-based terminal we tried to provide our users with an efficient task-solving device which could be used in a broad sphere--including areas which can no longer do without computer technology. We reduced the complexity and price of the equipment in such a way that this should not be at the expense of broad utility, modularity and performance.

The TPA Terminal I can be developed from both versions of the TPA-L computer (32K and 128K). The compact mechanics developed (Figure 1) gave far-reaching consideration to ergonomic and esthetic viewpoints and contain, in addition to the TPA-L computer, the following units:

--Display, With Operator Keyboard

The builtin display can be the KFKI alphanumeric UDT52 (DEC VT52 compatible) or the alphanumeric and graphic display, also developed by the KFKI, which can display figures with a resolution of 256 x 256 x 512 points and 64 x 32 alphanumeric characters simultaneously.

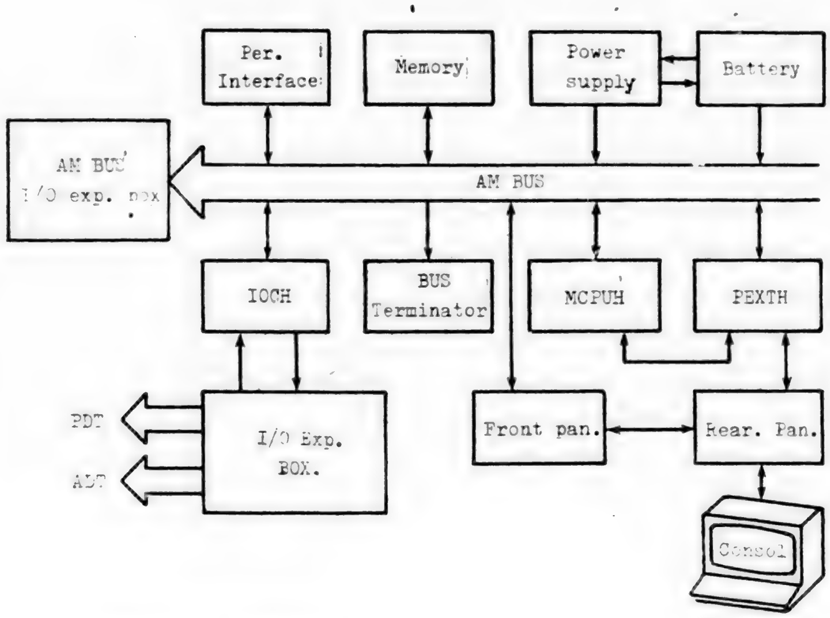
--Floppy Disk System

Two IBM-compatible (MOMFLEX MF 3200) floppy disks were built in, with a maximum capacity of 256 K words, which make possible efficient running of the operating systems of the machine.

--Central Power Unit

This unit provides power for the computer, display, floppy system and peripheral controls built into the terminal.

As a result of the program, bus and design compatibility of the TPA Terminal I with the other members of the TPA-8 family, it has available the complete peripheral assortment customary for the TPA-8 computer family.



1. ábra. TPA Terminál I.

Figure 1. TPA Terminal I

Construction, Technical Properties

As we mentioned in regard to our guiding principles for development, we increased the speed of the machine with a microprogrammed control architecture. This solution unites well in itself the hardware simplicity and great speed provided by the microprocessor and LSI elements. We made the central unit from elements of the AM2900 bit-sliced microprocessor family. The change in circuit design also made possible a change in mechanical design. Unlike the members of the TPA-8 family, thus far the mechanical system of the machine (card size, connections, etc.) is identical with the mechanical systems of the TPA-1140 computer family, in the interest of a uniform mechanical system.

Chief technical parameters of the central unit:

--word length, 12 bits plus twin parity (24 bits in the case of expanded arithmetic instructions);
--microprogrammed control;
--instruction decoding made up of PROM and FPLA circuits;
--microcycle time, 150-500 ns, programmable;
--the microprogram can be expanded by the user, which makes possible the definition of new instructions (512 x 56 bit writeable control store);
--13-level interrupt and DMA priority;
--vector and/or traditional interrupt management;
--the central unit consists of two 3/3 cards (MCPUH, PEXTH).

Other services built into the basic machine:

--net watching with program-interrupt adjustment;
--automatic start or restart when net voltage is turned on, from eight adjustable beginning addresses;
--operating mode control; distinguishes executive and user modes, providing hardware aid for running time-sharing programs;
--memory management up to 128 K words (this also provides memory protection);
--expanded arithmetic instruction set, which makes possible fast, double-precision arithmetic operations (multiplication, division, normalization, etc.);
--real-time clock; a quartz-controlled clock which can be adjusted to cause program interrupts with a frequency of 1, 5, 50, 500 or 5,000 Hz;
--intelligent console emulator, with the aid of which all the operator functions of the machine can be performed. This is realized with a control-panel memory (4 K words) which does not burden the operating memory and which offers the following services; an ODT program, which makes possible the running of interrupt programs and trace following; boot-strap programs; self-test; parity check, error elimination; program run, stop, run in one-instruction steps; and punch tape punching, copying and checking.

Memory System

We developed the following types of memory for the TPA-L/128H machine:

--32 K-word static RAM;
--128 K-word dynamic RAM, and
--16 K-word PROM or EPROM plus 16 K-word RAM.

These stores have twin parity bits. Protection of the stores against net failure can be provided with the battery backup option.

Input/Output System

The BUS organized I/O system provides a possibility for:

--programmed data transmission;
--autonomous data transmission;
--data transmission with interrupt;
--data transmission with vector interrupt.

Modern LSI-based peripheral controls connected to the AM BUS are available for the minicomputer.

With use of an I/O converter (IOCH) one can also produce the traditional PDT, ADT BUS system of the TPA-8, which also makes possible optional use of the TPA-i and TPA-s peripheral controls with the TPA-L/128H computer.

Peripheral Assortment

The assortment of peripheral units for the TPA-L family is very large.

The chief groups of peripherals are:

--paper tape peripherals;
--magnetic tape units;
--magnetic disk units;
--communications equipment;
--terminals;
--printers;
--CAMAC real-time peripherals.

New Software Products

The TPA-8 family, and the TPA-L/128H therein, has traditionally had good software supply. The high-level languages used thus far (FOKAL, FORTRAN, BASIC, CAMAC BASIC, MINIBOL, OPAL, MIDIBOL) and the operating system (OS/i, RTS/i, COS/i) have been supplemented with a few new products: OS/L, COS/H, RTS/H, OPAL/128, WPS, HELP and TEASYS 8.

Ideas for Further Development

The price and size of the devices developed in the TPA-8 family have decreased constantly as a result of use of modern LSI devices--in addition to increasing performance and the level of services. Proceeding further on this path, we began to develop a device falling into the category of a professional personal computer, the (TPA) Quadro.

We regard its chief use areas as:

--business applications;
--text-editing tasks;
--intelligent concentrator functions for megamini machines, and
--computer networks.

Production of a larger number of (TPA) Quadro machines will begin in 1984.

(Istvan Kovari graduated from the Budapest Technical University in 1963. From 1970 he was chief of the Magnetic Peripherals Research Group and from 1978 scientific department chief of the System Technology Department in the Computer Main Department of the MSZKI [Measurement and Computer Technology Research Institute]. In addition to other themes, he is dealing with system technology problems of building the TPA-L/128H into a larger system.)

(Lajos Leveleki graduated from the Electrical Engineering School of the Budapest Technical University in 1967. He has worked at the KFKI since 1973. He has participated in development of the TPA-L family since 1977. Since 1980 he has been theme and group chief for the TPA-L/128H program.)

(Andras Pataki's profession is electrical instrument worker. He is now a fifth year correspondence student of the Electrical Engineering School of the Budapest Technical University. He participated in development of the TPA-L/128H microprogram and in preparation of the Control Panel program.)

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DISK, MAGNETIC TAPE SUBSYSTEMS OF TPA COMPUTERS

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[Article by Bela Biro, Gabor Hackel, Istvan Kovari, Peter Patoh, Jozsef Steidl, Laszlo Sztanko and Gyorgy Tamas, of the Central Physics Research Institute: "Disk and Magnetic Tape Subsystems of the KFKI TPA Computers"; received for publication 24 Nov 83]

[Text] In recent years, on the basis of user needs, the applications-oriented development of our computer systems has strengthened. Applications-oriented user needs for the magnetic peripheral subsystems of our computer systems also increased.

The increase in needs appeared not only directly but also in an indirect form. Various central units came into being corresponding to the level of the several applications task groups. This development today means the creation "upward" of the megamini computers and "downward" of the professional personal computers. Satisfying the demands deriving from this has placed significant burdens on us also. Basically two computer families came into being, which we will refer to repeatedly in our article--the TPA-8 (TPA-i, TPA-s, TPA-L, TPA-Terminal I, TPA-L/128H and the TPA-Terminal II under development) and the TPA-11 (TPA-1140, TPA-11/EMU, TPA-1148 and the TPA-11/440 under development). Other articles which can be found in this journal describe these.

The assortment and quality of magnetic peripherals available to us on the market are a restricted resource for our effort to satisfy the requirements.

In the following parts of the article we will first outline the system of requirements, then provide a table giving data for the subsystems currently for sale or under development, and finally summarize the results achieved and the problems and mention a few new developments.

Guiding Principles for Development

The fundamental requirement with the TPA-8 family was to ensure program compatibility with the PDP-8 computers and with the TPA-11 family it was to ensure program compatibility with the PDP-11 American and the MSZR [minicomputer technology system] CM-3 and CM-4 and corresponding computers.

On the one hand, this eased the formulation of the developmental goals but, on the other hand, it made realization difficult since we had to achieve the goals set forth with different peripheral equipment (frequently differing even at the specifications level) and on a different parts and technology base.

The following general requirements were formulated in recent years in connection with magnetic peripherals and their connecting electronics within the several magnetic peripheral categories and for the several members of the computer families:

--increasing data capacity;
--increasing data traffic speed;
--increasing reliability;
--decreasing weight and volume;
--decreasing energy use;
--in some cases, data carrier-level compatibility with systems based on different computers in larger or smaller categories;
--architecturally equal strength between the magnetic peripherals and the other elements of the computer system;
--a low cost factor, and
--good serviceability and improving services.

We should mention a few of the above requirements separately in order to indicate the more significant increase in the magnitude of the requirements from the applications viewpoint.

The need for an increase in the data capacity of magnetic peripherals has appeared recently primarily in the area of business applications. This is characteristic of both intelligent terminals and our data base management computers. In the one case the characteristic value is the 0.8 to 1.6 M byte capacity of the 8-inch floppy disk while in the other it is the 100 to 200 M bytes of disks in disk packs.

The need for increasing data traffic speed and reliability has increased especially for industrial and laboratory applications systems. In regard to reliability, going beyond the bit error ratio and within this the ratio of errors which can and cannot be corrected, the requirements have increased in regard to the mean time between failures (MTBF), the mean time to repair (MTTR) and the shortness of maintenance time. This means that in addition to the technically usable factor the technically ready factor is also getting to be of ever greater significance. This is especially true if we think of the reliability of computer networks.

We should also mention the requirement in regard to architecturally equal strength. Actually this would include a few other requirements which we might call specific volume, weight and energy use (the volume, weight and operating energy per unit of information). With this amplification the concept of architecturally equal strength is not simply or primarily engineering pedantry but rather a measure of investment and operating efficiency.

A few years ago it was a strange paradox to find 300 to 400 kg large computer magnetic tape units being used with our minicomputers (not to speak of our microcomputers!) and even today they are using the 2 x 100 M byte EC-5067.02 large computer disks, which weigh 566 kg. We can be especially gratified that we have been able to design a new connector, without losing the guarantee service, to take the place of the control module and connector unit standardized in the ESZR [Uniform Computer Technology System], which also weighed several hundred kilograms.

At present we can satisfy the above requirements--including those emphasized--only with magnetic peripherals acquired by our users from capitalist import.

Additional supplementary requirements appear in the course of developing connection and control units. These requirements are of changing character depending both on the computer type and design and on the requirements of development. In the following we will list the more important requirements, noting development and change.

Design and system technology questions:

--A few years ago we developed connecting units which were independent, later they could be fitted into the case, with an independent power supply, on the basis of a separate design-technology base. The equipment could be connected to the bus of the computer with cables. (The separate power supply was significant also from the viewpoint of protection against interference.)

--Later, making use of a more modern parts base and increasing the capacity of the power units, it became possible to reduce the volume of the electronics and thus the requirements shifted in the direction of making use of the design-technology base of the central unit and the central power unit. These connectors, in part preserving the flexible configuration possibility, were connected directly to the internal, wired bus of the computer (back-panel). Connecting the cables of the peripherals sometimes makes necessary the interposition of distributor panels in the place of the upper connector of the card. Unfortunately, depending on the design of the computer, the design of the connector of the same peripheral may change also.

--At present, microprogrammed architectures are coming into the foreground. As a result of this, in the case of our newer connectors, we are separating in regard to system technology that part of the electronics providing data format control from the part providing connection to the computer itself. Where possible, we are trying to integrate the formatter electronics into the peripheral itself.

--Our general effort is to service more types of peripherals with a fewer number of connector controls. This means a design constraint in the direction of universalized and modular electronics.

--It is also our general effort to ensure chain organization on the peripheral side. This makes it possible for the extra electronics and connectors deriving from a radial organization not to burden the ever smaller connecting

units. Unfortunately, the design of a few peripherals does not make possible the realization of our aspirations (e.g., the CM 5303).

--In part the maintenance units (display panels, control cards) have been eliminated from the integrated designs and appear today primarily as service accessories or, more recently, as integrated self-test hardware of microprogrammable connectors.

As for the parts base, we can speak of a continual development spotted with retreats. According to our aspirations and developmental goals, we are always trying to use the most modern parts obtainable. Today this means bit-slice or microprocessor elements.

The final result is determined by the results of our aspirations and our possibilities. We expect much from the development in Hungary of large-capacity custom LSI's.

When developing magnetic peripheral subsystems for our individual computers in the course of our system design, we strive to take into consideration both the fundamental specifications requirements (data capacity, data traffic speed) and the cost factors, so that it will be possible to develop systems best suiting the applications task, from the smaller to the more complex and from the cheaper to those of larger size. We try not only to provide alternative possibilities to satisfy the increased reliability requirements but also, at the same time, to increase data capacity and data speed. Here also our aspirations and our possibilities combine to influence the final result.

In the course of development, we check at several levels fulfillment of the basic requirements pertaining to program compatibility--at the level of test program packages, system tests and finally operating systems, which we have developed ourselves or adapted.

In the course of development--in the case of exchangeable data carrier devices--compatibility at the data carrier level or satisfying the pertinent international standards poses significant requirements also. Here we put the emphasis on control and the adjustability of the peripherals. The result is influenced for the most part not by the connector unit but rather by the design parameters of the peripherals purchased and by the regularity of the prescribed maintenance during operation.

Magnetic Peripherals for TPA Computers and Their Connector-Control Electronics

In this chapter, we describe the peripherals and their connectors in tabular form. To make the data manageable we have constructed two tables. Table 1 summarizes the most important data on the peripherals used and Table 2 contains data on the connector-control electronics and the subsystem.

We add a few notes for use of the data in the tables:

--The sources for the data were Technical Conditions (TU), data sheets or manuals for the several devices. Where we did not find an official source, we left that part of the table empty.

--In giving the bit error ration we separated with a slash the quantity of bits falling on errors which could be eliminated with three re-reading (recoverable error rate) from the quantity of bits falling on errors which could not be eliminated by re-reading (nonrecoverable error rate). Where there is only one quantity (no slash it always shows the quantity of bits for bit errors which cannot be eliminated by re-reading. After the semicolon--where this can be interpreted and where there were such data--follows the quantity of band settings falling on one band setting error (seek error rate).

--We separated with a slant the average operating hour time between two failures (MTBF) from the average number of hours necessary to determine and repair failures and check after repair (MTTR).

--When giving data capacity we used the designations MB and KB instead of M byte and K byte.

--The physical capacity shows the unformatted complete capacity of the stores, the information capacity shows the capacity which can be used for data storage purposes and does not contain the capacity used for preamble, postamble, header and other service information purposes.

--When giving system capacity we left the index number corresponding to the number of peripherals (unit number) so that the physical and information capacity within a store should remain easily comparable. For the same reason, in the case of (double) peripherals contained in a system unit we put a double index number in addition to the unit number of the double peripherals.

--In general, the dimensions of the cards figuring in the design of the connector electronics in the table follow the card dimensions standardized for the central unit. We did not give these. Our primary goal was to indicate the system technology realization.

--The tables do not contain data on all peripherals and connector electronics traded for TPA machines in the course of past years. We thought that it would be useful to give in this article primarily the data on subsystems now preferred by us or to be introduced in the near future. This explains why the sequence of letters designating various options and versions is incomplete in regard to the NR XXXX model numbers of the connectors. The sequence in which the model numbers of the peripherals is given corresponds to the sequence of the letters indicating the different versions.

Let us note here that in the course of the past 5 years (since 1977) we have dealt with connections for 26 types of peripherals (13 disk stores and 13 magnetic tape stores) and for these we developed 16 types of connectors (connector families) in 36 versions.

A Few New Developments

Of our developments now underway we should mention our developmental activity aimed at making use of large-capacity disks and larger capacity magnetic tape units.

In addition to the CDC 9762 (80 M byte) the introduction of the EC-5067.02 (2 x 100 M byte) represents something qualitatively new in regard to the volume of system technology and connector work. The same thing also applies to the DM5 (5 M byte) fixed-head disk.

In the near future, we would also like to introduce a smaller (5-15 M byte) and a larger (80-160 M byte) capacity Winchester technology disk. We would use the smaller in our intelligent terminals and in our professional personal computers and we would use the larger in our megamini computer system.

Unfortunately the acquisition difficulties in regard to both the appropriate disks and the elements needed for connectors based on a modern parts base greatly hinder the realization of our plans.

As for magnetic tape technology, we succeeded in developing in past years--in the interest of eliminating use of a large number of types of large computer magnetic tape units without modern specifications--a small computer magnetic tape unit based on socialist parts with modern specifications (the NR 506A-MSX).

After signing a contract pertaining to introduction of manufacture, according to the plans, series manufacture will begin in ORION in the second half of 1983. The prototypes already manufactured by ORION prove the appropriateness of both the KFKI documentation and the preparedness of ORION.

At present, in the KFKI, development of an MSX version with formatter (Master tape drive) making possible PE recording (1,600 bpi) is nearing completion. This will mean that--in the event that appropriate spindle motors can be used--it will be possible to use, from domestic sources, 2 m/s vacuum-buffered magnetic tape units which can be placed in cabinets. As a result of the microprogrammable NRZI/PE formatter electronics (embedded formatter) it can be connected to a contemporary computer with relatively small connecting electronics (coupler).

Limitations on the length of our article do not make possible a description of the electronic structure and programming of the connectors.

[Biographical Data on Authors Unavailable]

Table 1. Magnetic Peripherals for TPA Computers

A TPA számítógépek mágneses perifériái — *1. táblázat*

(1) Mágneses periféria	(2) Típusjel	(3) Gyártó ország	(4) Fizikai kapacitás	(5) Max. adatforgalmi sebesség	(6) Kivitel, tömeg	(7) Megbízhatóság	(8) Megjegyzés
(9) Cserélhető lemezcsomagos (nagykapacitású) diszkes tárolók	EC—5061 C	BNK	29 MB	2,5 Mbit/s	önálló, 180 kg	10^9 1000/0,5	alrendszerben beszerezve (15)
	EC—5067.02	BNK	2×100 MB	6,4 Mbit/s	önálló, 565 kg	1000/2	bevezetés alatt (16)
	CDC—9762	USA	80 MB	9,67 Mbit/s	önálló v. szekr.-be szerelhető, 155 kg	10^{10} 4000/1,5	a felhasználó szerzi be (17)
(10) Cserélhető lemezes diszkes tárolók (Cartridge diszkek)	CM 5400—01/12 CM 5400—01/16	BNK	6 MB (3 MB fix + 3 MB cserélhető)	1,44 Mbit/s	szekr.-be szerelhető, 60 kg	10^{10}; 10^6 2000/1	
	CM 5410—01/12 CM 5410—01/16	BNK	12 MB (6 MB fix + 6 MB cserélhető)	1,44 Mbit/s	szekr.-be szerelhető, 65 kg	10^{10}; 10^6 2000/1	bevezetés előtt (16)
	PERTEC D 3441—M ⌀ 12 D 3441—M ⌀ 16	USA	12 MB (6 MB fix + 6 MB cserélhető)	1,44 Mbit/s	szekr.-be szerelhető, 59 kg	$10^{10}/10^{12}$; 10^6 4000/1	a felhasználó szerzi be (17)
(11) Fixfejes (head per track), fixlemezes diszkes tárolók	DISCMOM DM 2,5	MNK	2,5 MB	3,85 Mbit/s	szekr.-be szerelhető, 45 kg	$10^{10}/10^{11}$ 8000/0,5	DP 21 tápegység szükséges hozzá; bevezetés alatt (18)
	DISCMOM DM 5 (EC—5078)	MNK	4,8 MB	7,5 Mbit/s	szekr.-be szerelhető, 40 kg	$10^{11}/10^{12}$ 8000/0,5	bevezetés alatt (16)
(12) Hajlékony tárcsás (floppy diszkes) tárolók	MOMFLEX MF 3200 (EC—5074—01)	MNK	0,4 MB	0,25 Mbit/s	fiókba szerelhető, 5,5 kg	$10^9/10^{12}$; 10^3 800/0,5	a tápegységet és a fiókot a MOM szállítja (19)
	MFU 2 (CM 5606)	MNK	2×0,4 MB	0,25 Mbit/s	szekr.-be szerelhető, 30 kg	10^9 1000/1	2 db MF 3200, MOM tápegységgel és fiókkal, KFKI fejlesztésű formatterrel (20)
	MF 1800/900	MNK	218/109 KB	0,25/0,125 Mbit/s	fiókba szerelhető, 1,5 kg		bevezetés alatt (16)
Nagyszámítógépes szalagos tároló (13)	ZEISS EC—5017—02	NDK	kb. 20 MB (720 m)	64 Kbyte/s (2 m/s; 800 bpi)	önálló, 350 kg	5×10^8 600/0,5	
(14) Kisszámítógépes mágnesszalagos tárolók	CM 5303	BNK	kb. 20 MB (720 m)	36 Kbyte/s (1,14 m/s; 800 bpi)	szekr.-be szerelhető, 60 kg	10^8 1000/1	
	NR 506A (MSX)	MNK	kb. 20 MB (720 m)	36/64 Kbyte/s (1,14/2 m/s; 800 bpi)	szekr.-be szerelhető, 75 kg	10^9 4000/0,75	KFKI fejlesztésű, sorozatgyártása az Orionban 1983-ban indul (21)
	PERTEC T 8840—9—45	USA	kb. 20 MB (720 m)	36 Kbyte/s (1,14 m/s; 800 bpi)	szekr.-be szerelhető, 38,6 kg	$10^8/10^9$ 8000/1	a felhasználó szerzi be (17)
	PERTEC FT 8640A—98DF—45	USA	kb. 40 MB (720 m)	36/72 Kbyte/s (1,14 m/s; 800/1600 bpi)	szekr.-be szerelhető, 38,6 kg	$10^8/10^9$ 8000/1	formatterrel ellátott a felhasználó szerzi be (22)

Key:

1. Magnetic peripheral
2. Model number
3. Manufacturing country (BNK-Bulgaria; NMK-Hungary; NDK-GDR)
4. Physical capacity (cserelheto--exchangeable)
5. Max. data traffic speed
6. Design, weight (onallo--independent; szekr.-be szerelheto--can be put in cabinet; fiokba szerelheto--can be put in drawer)
7. Reliability
8. Note
9. Exchangeable disk pack (large capacity) disk stores
10. Exchangeable disk stores (cartridge disks)
11. Fixed head (head per track), fixed disk stores
12. Floppy disk stores
13. Large computer tape stores
14. Minicomputer magnetic tape stores
15. Acquired in subsystem
16. Being introduced
17. User acquires
18. Needs a DP 21 power unit; being introduced
19. MOM [Hungarian Optical Words] delivers power unit and drawer
20. With two MF 3200 MOM power units and drawer, with formatter developed by KFKI
21. Developed by KFKI, series manufacture will begin at ORION in 1983
22. Supplied with formatter, user acquires

Table 2. Magnetic Peripheral Subsystems for TPA Computers

TPA számítógépek mágneses perifériás alrendszerei — *2. táblázat*

(1) Alrendszer	(2) Gépcsalád (BUSZ)	(3) Illesztőcsalád		(6) DEC céltípus	(7) Vezérelt perifériák típusjelei	(8) Max. inf. kapacitás	(9) Megjegyzés
		(4) típusjel	(5) kivitel				
(10) Cserélhető lemezcsomagos	TPA–11 (UBUS)	IZOT 1006C E 002 *	önálló fiók	RP 11	EC–5061C	2 × 20 MB vagy 4 × 20 MB (8 × 20 MB)	2 vagy 4 diszkes komplett CM 5405 alrendszerként vásároljuk (15)
		DCUE–04	3 db kártya	RJP 04	EC–5067.02	4 × 2 × 88 MB	bevezetés alatt (16)
		NR 5507 A (DCUD 02)	3 db kártya	RJM 02	CDC 9762	4 × 67 MB	bevezetés alatt (16)
(11) Cartridge diszkes	TPA–11 (UBUS)	NR 5501 C, E	4 db kártya	RK 11	CM–5400–01/12;	4 × 4,8 MB	CM 5410: bevezetés előtt (17)
					PERTEC D3441–M ⌀ 12 vagy CM–5410–01/12	4 × 9,6 MB	
	TPA–8 (PDT–ADT)	NR 4501 B, C	3 db kártya	RK ⌀ 8	CM 5400–01/16;	2 × 3,2 Mszó	(18) 12 bites szó; CM 5410: bevezetés előtt
					PERTEC D3441–M ⌀ 16 vagy CM–5410–01/16	1 × 6,4 Mszó	
	TPA–8 (L/H, AMBUS)	NR 4520 A, B	1 db kártya	RK ⌀ 8	CM5400–01/16;	2 × 3,2 Mszó	12 bites szó; bevezetés alatt (19)
					PERTEC D3441–M ⌀ 16	1 × 6,4 Mszó	
(12) Fixfejes diszkes	TPA–11 (UBUS)	FHDC	4db kártya	RJS ⌀ 4	DM 2,5	8 × 2 MB	bevezetés alatt (16)
					DM 5	8 × 4 MB	
		Fixfejes diszk emulátor	1 db kártya	RF 11	NR 5306B típ. félv. tároló (128 KB)	8 × 128 KB	bevezetés alatt (16)
	TPA–8 (PDT–ADT)	NR 4502B	5 db kártya	RF ⌀ 8	DM 2,5	2 × 512 Kszó (vagy: 1 × 1 Mszó)	az órajel felírástól függ a kapacitás (20)
	TPA–8 (L/H, AMBUS)	Fixfejes diszk emulátor NR 4522–01	1 db kártya	RF ⌀ 8	NR 4522–02 típ. félv. tároló (512 Kszó)	512 Kszó (NR 4522A) 1Mszó (NR 4522B)	NR 4522–02 bevezetés alatt 512 (21)
(13) Floppy diszkes	TPA–11 (UBUS)	NR 5504	1 db kártya	RX 11	MFU2 (CM 5606)	kb. 1 × 2 × 256 KB	1 db MFU 2 2 db MFU 3200 floppyt tartalmaz (22)
	TPA–8 (PDT–ADT)	NR 4500 C	1 db kártya	RX ⌀ 8			
	TPA–JANUS (E–60)	NR 5586A (VRM)	1 db kártya	RX 50	MF 4001	kb. 4 × 400 KB	(23) bevezetés alatt (MF 4001: 800 KB)–MOM
	TPA–8 (L/H, AMBUS)	NR 5586C (VRM) NR 4521A	1+1 db kártya	RX ⌀ 8	MF 1800/900	kb. 4 × 200/100 KB	

[Table 2 continued on next page]

[Table 2 continued]

(2. táblázat folytatása)

(1) Alrendszer	(2) Gépcsalád (BUSZ)	(3) Illesztőcsalád (4) Típusjel	(5) kivitel	(6) DEC céltípus	(7) Vezérelt perifériák típusjelei	(8) Max. inf. kapacitás	(9) Megjegyzés
(14) Mágnesszalagos (IBM/ESZR/MSZR kompatibilis)	TPA–11 (UBUS)	NR 5502 A, G, H, J	11 db kártya	TM 11	ZEISS, EC–5017–02,	kb. 8×20 MB	NRZI (800 bpi)
					PERTEC T8840–9–45, CM 5303, NR 506A (MSX)	kb. 2×4×20 MB (CM 5303: kb. 2×20 MB)	
	TPA–8 (PDT–ADT)	NR 4503 D, F, G, H	önálló fiók	TM ø8	ZEISS EC–5017–02,	kb. 8×20 MB	
					NR 506A (MSX), CM 5303, PERTEC T8840–9–45	kb. 2×4×20 MB (CM 5303: kb. 3×20 MB)	
	TPA–11 (UBUS)	Coupler + Formatter(ek)	1+1 (+1) db kártya		CM 5303, PERTEC T8840–9–45, NR 506A (MSX)	kb. 2×1×20 MB kb. 2×4×20 MB	(24) bevezetés előtt NRZI (800 bpi)
		Coupler	1 db kártya		PERTEC FT 8640A–98DF–45, Formatteres MSX	kb. 2×4×40 MB	(24) bevezetés előtt NRZI (800 bpi), PE (1600 bpi)
	TPA–8 (PDT–ADT)	NR 4504 A, B Coupler	1 db kártya	TM ø8	PERTEC FT 8640A–98DF–45, Formatteres MSX	kb. 2×4×40 MB	(24) bevezetés előtt NRZI (800 bpi), PE (1600 bpi)
	TPA–8 (L/H, AMBUS)	NR 4524 A, B Coupler	1 db kártya				

Key:

1. Subsystem
2. Computer family (BUS)
3. Connector family
4. Model number (fixfejes diszk emulator--fixed head disk emulator)
5. Design (onallo fiok--independent drawer; db kartya--number of cards)
6. DEC target model
7. Model numbers of controlled peripherals (vagy--or; felv. tarolo-semiconductor store)
8. Max. information capacity (vagy--or; szo--word; kb--about)
9. Note
10. Exchangeable disk pack
11. Cartridge disk
12. Fixed head disk
13. Floppy disk
14. Magnetic tape (IBM/ESZR/MSZR compatible)
15. Purchased as a 2- or 4-disk complete CM5405 subsystem
16. Being introduced
17. CM 5410; being introduced

18. 12-bit word; CM 5410; being introduced
19. 12-bit word, being introduced
20. Capacity depends on clock signal writing
21. NR 4522-02, being introduced, 512
22. Contains one MFU 2 or two MFU 3200 floppy
23. Being introduced (MF 4001: 500 KB)--MOM
24. To be introduced

8984
CSO: 2502/37

NEW PROGRAM SYSTEMS OF TPA-11, TPA-8

Budapest MERES ES AUTOMATIKA in Hungarian No 2, 1984 pp 58-62

[Article by Messrs Peter Kiraly, Gabor Kota and Janos Telek of the Central Physics Research Institute: "New Program Systems in the TPA-11 and TPA-8 Minicomputers"; received for publication 24 Nov 83]

[Text] New Program Systems for the TPA-11 Minicomputer Family

The TPA-11 minicomputer can be used in single user and multiuser environments, primarily:

--to solve data processing tasks (data base management);
--for production-control tasks;
--for real-time supervision of laboratory and industrial processes, and
--for technical-scientific calculations.

An extensive system and applications software background makes possible a solution of the above tasks. Depending on the task to be solved we can put together relatively large configurations by expanding memory (up to a maximum of 4 M bytes) and selecting appropriate background stores, for which we can select the most effective operating systems and program packages. The basic operating systems are the following:

--FOBOS, a foreground-background operating system;
--DOS-RV, a real-time operating system, and
--DOS-RV-PLUS, a real-time operating system.

FOBOS V4.0 Operating System

FOBOS is an operating system for micro TPA-11 computers which provides a good developmental and running environment for users. The version used at present is the FOBOS V4.0 operating system which we developed from the FOBOS V2C and FOBOS V3B operating systems. FOBOS is a single-user, real-time magnetic disk operating system which can use various types of disks (floppy, fixed head, cartridge) as system peripherals.

The system contains four monitors--a basic monitor, a single-task monitor requiring 8-28 K words, a foreground-background monitor requiring 16-28 K words and an expanded monitor requiring 48 K-124 K words.

The single-task monitor services one user and his job. The foreground-background monitor makes possible the simultaneous running of two programs. In the foreground, the program taking care of the real-time task enjoys priority in use of resources. The program running in background can run when the foreground program has nothing to do. The expanded monitor has all the characteristics of the foreground-background monitor, but in addition it can handle a memory of a maximum of 124 K words. The system can handle many types of peripherals--additional disks, magnetic tape, line printer, card reader and paper tape devices.

From the programming viewpoint the system is completely peripheral-independent. One can also do batched processing under the FOBOS operating system.

The system makes available every device which may be needed for fast, efficient program development.

One can say of the FOBOS V4.0 system that its operating principles, monitor commands, archives and auxiliary programs follow the services of the newer DOS-RV systems, with simpler hardware and software requirements than usual with FOBOS systems. The operator's monitor for the FOBOS V4.0 can be learned easily; it is a trimmed down, updated version of the DCL monitor of the DOS-RV operating system.

In the foreground-background mode one can run six programs, the so-called system jobs, in addition to the previous foreground and background programs. The six possible programs can be written by the user also, but there are two previously prepared jobs, too--a modified error diagnostic program and a new FOBOS file monitor, the QUEUE monitor. The latter, together with the QUEMAN program, aids operation of a more advantageous printing procedure (SPOOL).

Programming Languages Which Can Be Used Under the FOBOS V4.0 Operating System

The FOBOS operating system makes possible the running of the MACRO-11 assembler, the FORTRAN-IV, BASIC, BASIC handling an analyzer, BASIC handling CAMAC modules and the MIDIBOL high-level programming languages.

The DOS-RV V4.0 Operating System

The DOS-RV V4.0 is a disk-based operating system which can be run on any TPA-11 processor having a UBUS. It provides the necessary environment for execution of a number of real-time tasks (program picture) in such a way that it uses a priority-structured event-controlled scheduling method. System generation makes possible software configuration for both small--16 K word--and large--3,840 K byte--systems.

The DOS-RV can be mapped or unmapped, depending on whether the system contains the memory organization unit.

If the configuration does not contain the hardware memory organization unit then the system can use only 16-28 K words of memory. If the configuration does contain the hardware memory organization unit then the system can use memory between 24 K and 1,920 K words.

The memory is divided logically into partitions into which the tasks can be loaded and run. The automatic memory-packing minimizes the fragmentation of the system partitions.

The task scheduler of the system takes care of real-time interrupts; it can distinguish 250 software priority levels.

The task priority given by the user determines the suitability of the task for execution. Thus, we can fix the task in a partition so that when it is activated execution of it can begin immediately or it can be stored on disk in a latent state.

The DOS-RV takes care of the complete program development set and a fast response-time run-time system. The program development and real-time tasks can run in the systems in parallel (with at least 24 K memory).

The software priority levels of the system make it possible for the user to reverse, track and install tasks without influencing the real-time task response.

We recommend multiuser program development only for systems larger than 32 K words. Passwords, LOGIN/LOGOUT, peripheral protection, cyclic scheduling and parallel execution of tasks with the same priority are possibilities provided by the system.

The total system has the traditional MCR command interpreter. As a new service, in mapped systems, we can set up a DCL, use of which is extraordinarily convenient. It can be established terminal by terminal whether the user wants to use MCR or DCL.

Divisible libraries are available also. Task-development work is aided by text editors (EDI, TECO, EDT, KED), a cross-reference table and other auxiliary programs (PIP, DMP, etc.).

The reliability software components are the following:

--journaling of processor, disk and magnetic tape errors;
--restart after net failure, and
--user error diagnostics (terminals, line printers, magnetic tapes, disks).

In addition the following optional possibilities are available in DOS-RV:

--logical peripheral designation;
--use of ANSI format magnetic tapes;
--line printer "spooler";
--loadable peripheral managers;
--dump after abort;
--dump after system failure;
--a developmental environment for MOS-RV systems;
--an optional full duplex terminal handler, which
--realizes DMA output;

--RMS serial and relative files, and
--direct connection of user tasks to hardware interrupts.

DOS-RV-PLUS V2.0 Operating System

We developed this version of DOS-RV-PLUS from the DOS-RV-PLUS V1.0 and the DOS-RV V4.0 systems.

Making use of the hardware properties of the TPA-1148 and TPA-11/440, the virtual address domain of user programs developed under DOS-RV-PLUS V2.0 was expanded so that one can provide 64 K bytes of memory for instructions and 64 K bytes of memory for data. This is twice the virtual address domains used thus far!

Among the new services of the system one of the most noteworthy is the new hardware error logging system (ERRLOG) and the new error diagnostics program package (UETP).

New system services are the EBCDIC code magnetic tape handling and the magnetic disk volume identification (Home Block) modifying procedure also.

The executive dynamic data area (the POOL) became larger and as a new service a POOL MONITOR program, PMT, checks use of the POOL. In the event of excessive use of the dynamic data area, this program intervenes in control of the system and regulates use of the area to the desired degree.

An accounting system notes the terminal and central unit times used by the users and use of the chief software and hardware units of the system. The operating system supports batched processing.

The resource management display program, the RMD, can describe four new data groups:

1. the states of active tasks;
2. the data base of a given task;
3. the data base of the accounting system, and
4. data on I/O activity.

The user can manage the system with the modified instruction set MCR and DCL programs or with a local CLI program designated for the user.

Finally, concerning system generation. Compared to the previous DOS-RV systems the DOS-RV-PLUS V2.0 generation procedure is more structured, easier to survey and more efficient, with creation of memory resident archives (FCSRES, FCSFSL, etc.) and automatic creation of multiuser programs.

Programming Languages Which Can Be Used Under the DOS-RV V4.0 and DOS-RV-PLUS V2.0 Operating Systems

In addition to the MACRO-11 assembler the high-level programming languages which can be used are the following: FORTRAN IV, FORTRAN 77, BASIC, BASIC-PLUS-2, PL-11, MPROLOG, MIDIBOL, PASCAL, STRUCC, FORTRAN, STRUCC COBOL and COBOL.

Note

The ADA language system is now under development. ADA is a high-level programming language defined on the basis of experiences gathered in the course of programming and system development practice and research.

Data Base Management

A number of types of data base management systems can be used under the DOS-RV and DOS-RV-PLUS operating systems:

--RIMR data manipulation program package;
--REFLEX logic-based query system;
--TPA-11 FORM-11 data input system;
--TRACCS-11 transaction processing services;
--DATATRIEVE query and report writing system, and
--DBMS data base management system.

In our present article we will deal in more detail only with the last two data base management systems.

DATATRIEVE V2.4

DATATRIEVE is an interactive system which was designed with the express purpose of being mastered easily without programming experience and so that it could be used to solve tasks connected with data management.

Thus, for example, with the HELP instruction one can get information about use of the system; in the GUIDE mode the system works with the user and at the same time analyzing, correcting and writing the instructions typed in; while with the aid of the ADT (Application Design Tool) record file and field descriptions can be prepared via a simple dialog.

The definitions mentioned are stored in a data dictionary and are used in the course of data handling or report preparation. An extraordinarily broad scale of instructions is available, which we can organize into procedures by introducing control structures and global or local changes. Thus, we can resolve the text editing operations which arise most simply with the built-in editor.

With its report writer, DATATRIEVE can generate reports satisfying virtually every requirement. For example, one can have breaks at multiple levels, perform automatic addition at the breaks, generate averages and define virtual fields.

DBMS V2.0

The DBMS-11 is a data base management system based on the so-called CODASYL proposals and realizing them.

Creating the data base begins with preparation of a general logical-physical description (schema). The various definitions are stored in the data dictionary of the data base in a form suitable for further processing.

In general, the data management operations are executed from user programs via subschema, but there is also a possibility for simple interactive querying (DBQ) or one can use the services offered by DATATRIEVE V2.4 also. The DBMS-11 services can be accessed from COBOL and FORTRAN 77 programs, supported by a preprocessor, but this can be done from every language which contains the CALL instruction.

When running, the control system of the data base (DBCS) prepares a journal (DBMOBL), provides data protection and secrecy (DBMS11), and executes on-line recovery in the event of program error.

The DBMS-11 V2.0 can handle a number of data bases simultaneously (a maximum of five).

Remote Data Transmission Packages, Networks

The more important communications program packages which can be run under the DOS-RV and DOS-RV-PLUS operating systems are:

--2780 batch-terminal emulator;
--FOBOS terminal communications program;
--FILTER ESZR/DOS-RV fast file transmission;
--3270 terminal emulator package, and
--DOS/NET network software.

We will deal in more detail only with the latter.

DOS/NET V3.0

The DOS/NET V3.0 software makes it possible for an appropriately configured DOS-RV system to participate as a node in a computer network with optional topology.

One can realize the following between DOS/NET nodes:

--task-task communications;
--remote file access;
--terminal-terminal communication;
--remote terminal service;
--file transmission;
--network maintenance, operation and supervision;
--remote program control, and
--transfer and execution of indirect command files.

Users of DOS-RV can access the services of DOS/NET from programs in the MACRO, FORTRAN, FORTRAN 77, BASIC-PLUS-2 and COBOL languages and--as operator --from terminals.

Transmission between nodes--in accordance with the rules of the DDCMP line protocol--takes place on synchronous and asynchronous lines, via parallel connectors, in half duplex or duplex operation.

When realizing a link between nonneighboring nodes the DOS/NET uses adaptive path generation. Between neighboring nodes transmission can be done simultaneously on only one physical line.

New Applications Program Packages

Many types of applications program packages can be used under the DOS-RV and the DOS-RV-PLUS operating systems.

A detailed description of these would require many pages, so let us list only a few of the best known:

--business transaction system;
--PCS-11 net design program package, and
--SOMIKA software quality-control and capacity-checking system.

New Program Systems for the TPA-8 Microcomputer Family

With the appearance of the new members of the TPA-8 microcomputer family (TPA-L, TPA-L/128H, TPA Terminal II) it has become possible to develop further the already well-proven program systems (COS/i, OS/i, RTS/i, OPAL, NET) and create multiuser systems and a new text-processing system. The further-developed operating systems are software compatible with the sold systems, therefore the user programs prepared thus far can be run under the new systems also. In the following we will describe briefly the new programs.

COS-H Business Operating System

More than 50 TPA-8 small computers are used in the country with the COS/i operating system for the solution of business tasks. In general these are systems equipped with several terminals--a maximum of seven--on which data are recorded, checked and processed in parallel operation. The chief elements of an interactive business-oriented operating system are a data input program based on a foreground/background running system, a MIDIBOL high-level language-interpreter program and a running system for one or more terminals plus data management programs (sorting, selection, maintenance, table preparation, IBM/ESZR format magnetic tape handling, IBM/ESZR remote data transmission emulator) supporting processing. The user can select between two operating modes--in the foreground/background system he can record from six terminals with one for batch processing or in the MULTI system he can run an interactive data management program written in the MIDIBOL language on all terminals.

The significant advantage of the COS/i operating system is compactness. In the operating modes described one can effectively manage seven terminals with a memory of 32 K words. Naturally this is accompanied by certain limitations in regard to performance and flexibility.

The COS/H operating system being developed is aimed at more flexible support of multiterminal interactive business tasks while preserving efficiency and compactness. Going beyond the earlier services the integrated realization of remote data transmission is of special significance. One can select, from the individual terminals, whether the terminal will function as a remote terminal of an IBM/ESZR large computer, with IBM/ISZR emulation, or as a remote terminal of a TPA-1148 megamini or perform data input in the local mode or join a multiterminal MIDIBOL program. In addition, one can run the COS/i background processing system on the console terminal also.

The MIDIBOL language will be developed further also. Approaching MIDIBOL-11 it will be possible to call up external subroutines and do modular programming through them. One can call up as subroutines the formatted display and input of data fields and records also. One can run MULTI-MIDIBOL as a foreground task of the foreground/background system, and so the advantages of the two earlier separate systems can be combined.

The COS/H will handle more economically, more flexibly and more reliably than previously the disk areas, the so-called logical units, designated as locations for the data files. Performing operator functions will become more convenient and faster also.

The next phase in the development of the COS/H operating system will be the ability to handle a lower-case character set and realization of text-editing possibilities.

OS/L and MULTI OS/i Operating Systems

The OS/i operating system is a general-purpose, single-user operating system for the TPA-8 computers which, with its system programs (monitor, editors, file handlers, assembler, tracking, cross-reference program, etc.) aids the development and running of programs. Under OS/i one can use the BASIC, FORTRAN IV and MIDIBOL high-level languages. The system also supports batched processing. We developed the OS/i system further in two directions.

The OS/L operating system is a further development of the OS/i system which ensures that user programs can use memory which can be expanded to 128 K words. Every program written under OS/i can be run under OS/L also but even under OS/L the high-level languages can use only 32 K words of memory.

The MULTI OS/i multiuser operating system makes it possible for several users (a maximum of four) to use the system programs of the OS/i operating systems at the same time to develop or run their own programs.

RTS/h Real-Time Operating System

The RTS/h operating system is a further development of the RTS/i real-time operating system which makes it possible to divide the available resources (memory, central unit, peripherals) along more timebound tasks. The RTS/h makes it possible for the user to efficiently exploit the increased central memory and new hardware possibilities of the computer. The RTS/h system, in addition to taking care of its own real-time tasks, has the capability of operating in parallel with the single or multiuser OS/i and WORDS systems and the NET remote data transmission program.

WORDS Text-Processing System

The editor programs used thus far on the TPA-8 machines effectively aid program development but are not suitable for performing text-processing tasks.

Handling the WORDS text-processing system is relatively simple, it can be learned easily, and at the same time it aids the swift and convenient description and correction of editing commands and textual materials. The WORDS system contains a screen editor and printer program. In the first quarter of 1984, it will be supplemented with list preparation and automatic form letter preparation program packages.

The editor works on a VDT-52101 or other VT-52 compatible display and can be controlled with a keypad keyboard. The screen displays the text as it will appear when printed; every change made in the text can be followed on the screen. Margins and tabulators can be changed. When typing, the program automatically breaks the text into lines and if necessary the lines can be right-justified.

The most important instructions of the editor are the following:

--cursor movement in four directions; shifting cursor backward or forward to the desired character, to the beginning or the end of the text buffer, or to the beginning or end of the line;
--overwriting or interpolation of text;
--erasing characters, words, sentences or paragraphs;
--erasing or transposing blocks of text;
--reordering paragraphs according to different margins;
--search on basis of character sequence;
--replacing character sequences with different text or text of different length, and
--use of library files (prewritten parts of text can be interpolated in the text from the library file).

The printer program breaks the text into pages and automatically writes headings, page numbers and footnotes on the basis of print control instructions written into the text.

The single user version of the WORDS text-processing system can be used on any TPA-8 computer. We have developed a MULTI WORDS system for machines containing 128 K words of central memory, where text-editing work can be done simultaneously on four terminals.

NET Computer Remote Data Transmission Link

The OS, RTS and WORDS systems can be supplemented with remote data transmission functions also. With the aid of these a small computer can be linked directly via a postal line to IBM, Siemens or ESZR large computers or to TPA-11, TPA-8 or other small computers. It is possible, via the remote data transmission line, to make use of the services of other computers, to transfer files, exchange programs or carry out tasks requiring distributed processing.

OPAL 128K

The OPAL 128K system is a program system and high-level real-time programming language suitable for performing industrial process supervision and process control tasks on a TPA-L/128H minicomputer; it is a further development of the OPAL 80 system which has proven itself well in the course of industrial applications.

The OPAL 128K system makes use of 128 K words of memory to translate a user program and when running the programs. The translation time has been reduced to about one-fifth compared to earlier versions (partly thanks to the greater operation execution speed of the new machine). It has become possible for the entire user program or a large part of it to be in memory as the program is run.

The programs of the OPAL 128K system fit into an OS/L operating system based on an optional background store, but programs can also be run on TPA-L/128H machines not containing a background store (industrial environment).

In the interest of increasing efficiency, the running system uses the expanded instruction set realized in the TPA-L/128H firmware (stack management and reentrant subroutine calling).

[Biographical information on authors available]

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CURRENT SCIENTIFIC DEVELOPMENTS DESCRIBED

Lasers in Metrology

Warsaw RZECZPOSPOLITA in Polish 25-26 Feb 84 p 4

[Article by (Reg): "Lasers in Metrology"]

[Text] Specialists at the Military Engineering Academy [WAT] are studying the uses of laser beams for metrology, metallurgy, geodesy and construction. They have developed a series of laser instruments for indication of straight lines and angular deviations.

The instruments allow fast and reliable measurement of magnitude, direction and deviations from horizontal or vertical plane. They are based on the latest achievements in metrology, and their practical applications bring tangible economic effects, for instance, the use by the WAT, in the construction of the Northern Port, of the laser device for marking the sides of the sea channel resulted in a reduction of excavation time, which saved about 20 million zlotys.

It is impossible to list all new developments at the Quantum Electronics Institute of the WAT, where the infrastructure of Polish laser technology has been built. The group headed by Colonel Professor Z. Puzewicz has been working on lasers for two and a half decades, fully aware of the huge potential and future prospects of this field.

Holography in Aviation Technology

Warsaw RZECZPOSPOLITA in Polish 28-29 Jan 84 p 4

[Article by (WL): "Holography in Aircraft Engineering"]

[Text] The conventional methods used in industry fail to provide the comprehensive data on the degree of deviation of the shape of a working surface from that drawn by the designer.

At the Metrology Unit of the Engineering Institute of Rzeszow Polytechnic, a method has been developed for testing curvilinear surfaces of aircraft engine blades which makes use of laser beams.

An element of the model blade and the same element of the tested blade are photographed successively in the same frame in a laser beam. The resulting holographic image, in the case of a deviation in the surface topography, will show fine interference lines. The form and pattern of these lines provides a complete profile on the degree of error in machining the component. The accuracy of the measurement by holographic interferometry is much higher than in the conventional techniques, providing a new quality in measurement technology.

New ComPAN-8 Microcomputer

Warsaw ZYCIE WARSZAWY in Polish 19 Apr 84 p 6

[Article by (b.k.): "From a Conference of the Section on Technical Sciences of the PAN: Professional Computer from the Polish Academy of Sciences; Cooperation with Industry; Opportunities for Sales in CEMA Nations"]

[Text] (from our own correspondent) On 18 Apr 1984, a plenary session of the PAN Section on Technical Sciences took place in Warsaw. The subject of discussion was the development and possible applications of Polish professional microcomputer ComPAN-8. The computer has been developed at the Institute of Complex Automated Systems of the PAN at Gliwice under the direction of Professor Stefan Wegrzyn.

The capacities of the microcomputer were demonstrated at the conference. Through telephone lines the computer was linked to a large digital machine of the Odra-305 type located at Gliwice. A bibliographic file had been placed in the Odra memory earlier. The participants of the conference could order and receive within a fraction of a minute, displayed on the ComPAN-8 microcomputer screen, the titles of scientific periodicals published in a requested year or articles on a requested subject. The system provides access to data collections to a large group of users through the existing telephone communication lines.

The professional microcomputer ComPAN-8 can be used to automate research processes, assist design and supervise scientific experiments, as well as in medical diagnostics, text editing, etc. It has a capability for dialogue not only between man and machine but between two computers. This requires detailed programming of the procedure of data exchange; the theory for machine-machine communications has already been developed.

Based on the professional microcomputer model, several applications have already been implemented, including a system for studying the dynamics of objects, a system for filter design and acupunctural diagnostics software. The latter software was demonstrated at the conference, with one of the microcomputer designers serving as the human subject. Operational software for the microcomputer has also been developed. For instance, one program can assist a physician in evaluating the health status of individual organs, another program can assist a designer, reducing the development time from months to hours, etc.

The ComPAN-8 microcomputer design has already been introduced for production at the Computer Technology Enterprises Mera-Elzab at Zabrze. Work is also going forward to develop the attached equipment and software. In particular, several dozen RTDS-8 systems for assistance in microprocessor engineering design have been produced, and there are prospects for selling them on CEMA markets. One such device is now in trial operation at the Joint Institute of Nuclear Research at Dubna near Moscow.

The cooperation of the PAN Institute of Complex Automated Systems at Gliwice with Mera-Elzab Enterprises at Zabrze is beneficial for both parties. On the staffs of both--research and production--organizations are people of the same age who are graduates of the same schools and represent the same levels of knowledge. Thanks to this cooperation and understanding, the projects originating from the Polish Academy of Sciences become part of production plans in a short time and serve as the basis for industrial operation.

Avia-C Radar Exports

Warsaw ZYCIE WARSZAWY in Polish 7 Feb 84 p 6

[Report by the Polish Press Agency: "Export of Radar from the Warsaw Rawar Factory"]

[Text] In the framework of the CEMA agreement on specialization of production of sea and aviation radars, the Warsaw Radio Factory Rawar has the opportunity for regular development of exports. At the top of the list of buyers of its Avia-C radars is Czechoslovakia. The unit is already operational at Buchtowec and will shortly be joined by another radar, and a third will be delivered in 1987. For two years, an Avia radar has also been operating in Cuba, and currently another similar installation is being put in place by Polish specialists. These radars are specially protected against corrosion, which is a problem in that humid and warm climate, as well as against hurricane winds.

Expansion of radar sales is to take place under the agreement signed by Rawar with the Soviet Prommasheksport agency, which is the supplier and producer of airfields and communication devices. Through this intermediary, Polish radars end up in many countries throughout the world.

A traditional market for sea radars is the GDR, which mainly buys them for fishing boats. Yacht builders in the FRG and France also furnish their boats with Rawar equipment. The newest model 700 for seafaring ships has been met with lively interest. It is being purchased, among others, by Argentine, Spanish and French companies; in 1983 contracts have also been signed with the GDR and Rumania. The radars also leave Poland as part of equipment mounted on exported Polish-made ships.

New Medical Radiation Detector

Lublin SZTANDAR LUDU in Polish 11 Jan 84 p 3

[Article: "Polish Detector of Neoplasms"]

[Text] The list of expensive and complex devices for the early detection of tumors has recently been joined by a unit of a Polish descent. The diagnostic equipment has been developed by specialists of Nuclear and Medical Electronics Institute of Warsaw Polytechnic, and makes use of a new original design of radiation detector.

The radiation is emitted by radioactive isotopes introduced into the sick organ. Depending on the condition of the tissue (for instance, during the development of a neoplasmic tumor), various types of changes in radiation are observed. The task now is to register all these changes in detail and properly interpret them.

The Polish diagnostic device features a registration capacity that is several times higher than that in existing instruments, paralleled by a simpler overall design. The gamma radiation detector, which is the core of the equipment, is a cell filled with noble gas--argon--and connected to a transforming device called a gamma electron. An additional advantage is the fact that while most devices of this kind in the world use a different noble gas--xenon--in Poland it is not produced. On the other hand, argon is relatively inexpensive and available.

The sensitive detector would still serve no purpose if the system did not have an interpretation unit which could "decode" information. Here, too, an original device is used which is based on two Polish minicomputers--the Mera-300 and the Mera-60. The configuration includes the Jowisz television monitor, which displays the two-dimensional color image. The electronic equipment is available on domestic markets. It features high reliability and universality, being compatible with all kinds of computers. The entire diagnostic system can be manufactured in Poland without major cooperative and technological contacts with Western countries. Given all these merits, the new product can be described as a modern medical equipment system of a world level that we can produce domestically.

Clinical tests of the equipment are to begin early in 1984. Some time will have to elapse before the results of these tests are known.

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POLAR RESEARCH, EXPEDITIONS DESCRIBED

Krill Research in Antarctica

Warsaw EXPRESS WIECZORNY in Polish 23 Feb 84 pp 1, 2

[Interview with Professor Stanislaw Rakusa-Suszczewski, Director of the Polar Exploration Unit, Institute of Ecology of the Polish Academy of Sciences, by Wanda Waijgora: "A Look Into the Biggest Ice Breaker on Earth; The Professor Siedlecki Returns From Polar Expedition"; date and place not specified]

> [Text] What is new in Antarctica, at our Arctowski polar station? Where have all the kergulena and notothenia, these tasty fish with white meat from Antarctic seas, disappeared? Those species a few years ago were among our staple foods, and now have become just a memory.

The question is pertinent, because recently the research vessel of the Marine Fisheries Institute, the Professor Siedlecki, returned from its Antarctic expedition. The vessel has been rarely in use these past two years. It brought to the Arctowski Station a group of hardly more than a dozen polar explorers who will spend the winter there with all the necessary equipment and supplies. This group, which is very small because of the polar station's limited budget, for the first time includes a woman--Associate Professor Anna Kolakowska from the Agriculatural Academy at Szczecin.

The Professor Siedlecki brought back to Poland the polar explorers who had been left in Antarctica by the previous, seventh polar expedition of this ship. In addition to the 13 explorers, the passengers included two sick fishermen, taken on board from the Kaszuba II floating fishery plant.

The expedition of the Professor Siedlecki was organized by the Institute of Ecology of the Polish Academy of Sciences. An interview with the director of the Polar Research Unit of this institute, Professor Stanislaw Rakusa-Suszczewski, follows.

[Answer] Changing the personnel at the Arctowski Station was not the only purpose of the expedition (said Professor Rakusa-Suszczewski). Another function was to study the fishing prospects on those areas of Antarctic

seas where, traditionally, our fleet has been fishing since 1978. Now they are catching mostly lobster, which are not accepted in Poland but are willingly eaten and bought in other nations.

[Question] We would prefer, for instance, kergulena ...

[Answer] Our findings, unfortunately, are negative. The fisheries fields have been exhausted, because we were not the only ones to harvest them. We did find small amounts of kergulena, but not enough to make it worth sending the fishery's fleet there.

[Question] Poland is a participant in the exploration of the Antarctic ecologic system. Had the expedition of the Professor Siedlecki anything to do with that?

[Answer] In general, yes. We take part in the international program code-named BIOMASS. Among other things, this program explores krill, which is a key organism in Antarctica's ecosystem. Krill is eaten by all animals, and there is no doubt that it can be consumed by man. However, man cannot digest the shells. The technology for separating krill from its shells, which contain fluorine, is known, but too expensive.

[Question] Many hopes have been linked with krill, but nothing came out of it in Poland. It has lost credibility ...

[Answer] And undeservedly so. This happened because krill was wrongly associated with a protein factory that was supposed to produce protein not from krill but from fish industry waste. This was a propaganda error. At any rate, we do not plan to use krill catches for Poland, but would offer it to potential buyers.

[Question] The fact that studies on krill are international indicates continuing interest ... ?

[Answer] The exploration project was started in 1976 in response to a broad interest in krill shown by many countries. The question is whether it can be caught without disrupting the biological balance. The findings have been variable, and the methods used in this research are not entirely reliable.

Currently, a number of long-term experiments are being conducted to find definitive numeric results on the Antarctic ecosystems.

[Question] Were you the director of the last polar expedition?

[Answer] Initially, myself, and later Dr. Piotr Bykowski and Dr. Maciej Lipski took over the reins.

[Question] Is it true that an increasing number of tourists have visited the Polish Arctowski Station?

[Answer] The number of Antarctic tours has been growing, especially from the Western Hemisphere. Our station has been visited by 1,000 persons, including Poles.

Arctic Research Program

Warsaw TRYBUNA LUDU in Polish 25-26 Feb 84 pp 1, 8

[Communication from the Polish Press Agency: "A Report from Spitsbergen: The Work Winter of Polish Scientists Is Over"]

> [Text] Winter is ending on the Spitsbergen. On 13 February 1984, after the polar night that continued several months, the sun was seen for the first time. However, it hides behind a thick layer of clouds.

In a radio message from the Polish polar station Hornsund in the polar region, it was reported that the past winter was not harsh. There were no major emergencies, and the research program was conducted according to plan. In January and early February, photogrammetric studies were done on the terrain; during the polar night, days with a full moon were utilized.

The winter that is now coming to a close was relatively mild for the Arctic area. Maximum temperatures were 1.6°C, with a minimum of -19.5°C. There were, however, long and powerful winds. Thick clouds made astronomical observations difficult.

Throughout the winter, polar bears approached the station. Their number, however, was smaller than in previous years. Our polar explorers have sighted about 40 animals. Lately, they have been preparing for the start of a larger scale terrain surveying--geodetic and photogrammetric--studies.

New Antarctic Research Expedition

Gdansk DZIENNIK BALTYCKI in Polish 25 Mar 84 pp 1, 2

[Article by M.L.: "The Professor Siedlecki Preparing for a New Research Expedition"]

[Text] After its recent return from Antarctica, the research vessel of the Marine Fisheries Institute, the Professor Siedlecki, is undergoing repairs at the Gdansk Repair Shipyard. This is a necessary step in preparing for a new research expedition, which will begin in July 1984.

"In the framework of a 'gentlemen's agreement,' and in accordance with the CEMA recommendations, we are planning to conduct in all possible areas not only coordination of work and exchange of results but also various forms of cooperation," says the learned secretary of the Institute and executive secretary of the Joint Coordination Commission, Dr. Zbigniew Bruski. "One of these forms--and we believe it to be particularly important--is organizing

international research expeditions to study the reserves of living organisms outside the territorial waters of individual nations. These are broad expanses, and it is essential for the cooperation of fisheries fleets of various nations to embrace broad regions by exploration and to ensure an equitable distribution of costs and risks involved. This approach to exploration underlines the scientific character of expeditions, without elements of competition, that will ensure beneficial results for everyone. The goal is to find new fishery techniques and technologies for processing of sea organisms."

The 1984 expedition undertaken on Poland's initiative is a "first" of sorts. In previous international expeditions, research vessels and fishing boats of various nations explored preassigned areas and then jointly processed the results and drew conclusions for the benefit of all parties. With the new approach, the expedition that will cover two regions of the ocean will use two research vessels and two fishing boats, including the Professor Siedlecki, that will have an international team of scientists on board.

"This expedition is already under way," adds the chief of the section for organization and foreign contacts of the Institute, Borys Kisler. "It was in fact started in January of 1984, when the Soviet vessel Volnyi Veter left Kaliningrad and then was joined by two fishing boats from Bulgaria and the GDR. They are exploring region 1 of the northeastern Atlantic (north of Britain). The Professor Siedlecki, however, will go to region 2 --the area 200 miles off Portugal's shore. Working on our ship will be a team of fishery experts from Cuba, GDR, Rumania, the USSR and Poland. It will include biologists, hydrologists, hydroacousticians, skilled fishermen, technologists, computer engineers, a parasitologist and a planktonologist. The leadership will be provided by two ichthyologists--director is a Pole and his deputy is a German.

"The expedition is financed by partners of the agreement (three or four nations). As far as Poland's participation in the costs is concerned, in view of the mainly long-term character of the expected results, they will be largely covered from the centralized budget funds.

"The hard currency costs will be covered by all participants; Poland's share will be financed by our open-sea fishing industry. These enterprises are interested in the results of these studies and must 'purchase' each promising result. But it ought to be applicable to economic practice. Scientists take this into account."

Similar international expeditions will also be organized in future years. On April 16, 1984, a meeting of fishery experts and members of the joint exploration project will be held at the Marine Fisheries Institute in Gdynia. They will concentrate on developing a program of the second stage of the expedition for 1984 and its continuation in 1985. The national composition of the teams will be finalized, and the principles of financing and international settlements will be determined.

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MINICOMPUTER DEVELOPMENT, PRODUCTION DESCRIBED

Warsaw PRZEGLAD TECHNICZNY in Polish No 15, 8 Apr 84 pp 11-13

[Article by Donat Zatonski: "A Mournful Rhapsody for Minicomputers"]

[Text] For an economy which is in such a poor state as ours, the first and most valuable and effective action is to enhance reliability and accelerate the accumulation, processing and transmission of information. Experts claim that this is a basic condition, absolutely indispensable for any kind of reform.

Modern civilization has created a perfect tool for these purposes--computerization. Whatever complaints--even justified--are heard as to the mastery of computer technology and principles of information science by our management personnel, it should be said that we have attained certain results. I know that from various meetings which I have attended and where I heard the users of data processing equipment and systems say that their skills and experience have already outgrown the possibilities available to them. This concerns availability of equipment and the basic conditions required for utilization of these skills.

Many economic and industrial abnormalities can be written off to economic adversities, as is often done. But one abnormality that cannot be justified is the phenomenon of "throwing out the baby with the bath water," which is seen, in particular, in computerization. So much has been done in this field in the 1970's that one can hardly tell who is to blame for the fact that the term computerization has acquired an unreliable and fuzzy connotation. There are all indications that, in the face of economic management logic, computerization has been cancelled in the 1980's from the list of top priorities. For all kinds of bureaucrats who are happy to shuffle papers, for incompetent managers, this is a comfortable situation. They can continue keeping unfavorable documents and data in cabinet files, while the true state of affairs is easily concealed.

In chaos and disarray, computerization and information processing lose their reason for existence. However, if there is a genuine desire to put things in order and put an end to this chaos, then information science and computers become an indispensable tool. These are commonplace truisms,

which makes the fact that they are incomprehensible, are not understood, even worse.

Abacus for Sale!

That would be a joke were it not for the sad background of the occurrence. In the Rozycki Market in Warsaw, a hawker was rattling with a bunch of abacuses, the kind that our mothers and grandmothers used in the old days. When I came closer to take a look at these antiques, I heard the offer: "Abacus for sale--200 zlotys! ... " The conclusion is: maybe abacuses will return to favor. The price already is high. Lately, I had a long discussion as to whether our computer industry is falling apart or not. Experts, most of them users of the equipment, were inclined to acknowledge that it is falling apart. The truth probably lies somewhere in the middle.

Of the accomplishments and industrial applications in the last two years, the following can be mentioned:

the R-32 computer system with working memory of 1 MB, the operation system OS/JS with a software for remote data processing; a two-unit computer system R-32 with basic software to be used in high-reliability operations; communication processor EC 8371.01 for JSEMC that allows connecting computers of the Uniform System with a large number of terminals into a network (up to 350 terminals); the system of remote and local screen monitors of the Mera-7900 type (produced on a license) with mechanisms for joint operation with the R-32 computer; data preparation systems Mera-9150 (based on a license) with Polish-made peripheral devices. So much for the "large computers" of the Uniform System of Electronic Digital Machines (JSEMC).

As to the System of Small EMC, the list of achievements includes the following items:

the minicomputer system SM-3 (compatible with the PDP 11/05) based on the Soviet-made processor and the SM-3 + CAMAC complex; the data collection subsystem for industrial control units, including programmed controller (minicomputer) SM-54/60, special terminal SM-9401 and standard external devices; the minicomputer system Mera-100 or Mera-200 (based on a license); microcomputers Mera-60 and Mera-80; screen monitors Mera-7952 and Mera-7954 (based on a license); tape cassette memory PK-1; compact tape memory PT-305; paper tape processing station SPTP-3; and floppy disc memory PLX 450.

All this was implemented in the framework of research under the nodal problem 06.1, "Development of Computerized Systems of Automation and Measurement," and nodal problem 06.2, "Development of Telecommunications: Systems and Equipment."

In 1976-80, more than 2 billion zlotys were allocated.

The official statistics look good, but when you ask the users they throw their hands up in despair. Only single copies or very small amounts of all

these equipment units are produced.

"The major trends of research and development and industrial introduction activities in 1981-85 will be to continue the implementation of development projects started in previous years (1976-80). This involves development of industrial production equipment and system software for selected domestic users and ensuring the maintenance of existing markets in the framework of specializations practiced by Poland within the CEMA (printers, screen monitors, specialized terminals and telecommunications processors, data preparation systems, ferrite working memories, tape cassette memories, floppy disc memories and certain other peripheral devices); we should also create the possibility for broadening our export offerings by new nomenclature, especially in the area of Smaller EMC Systems and JSEMC Remote Processing System."

Such are the suggestions offered in a document entitled "Evaluation of the State of Computer Engineering in Poland" published in January of 1984 by Secretariat of Informatics Committee of the Ministry of Science, Higher Education and Technology.

Minicomputer for Sale!

Large and wealthy enterprises that managed to take advantage of the possibilities available in the past decade today have their own information centers and large computers. That only means more trouble. While we were struggling with our difficulties, the world was moving forward, and today large computers are less important in the economy than minicomputers with diverse software tailored to the needs of each particular user. On the banks of the Wisla, an optimist is saying,"By falling behind we have actually won. All we have now to do is to get to work and produce mini- and microcomputers with appropriate equipment and software."

That minicomputers will move to the fore in most economic management systems was known to our information scientists long ago. The table below shows Poland's output of minicomputers, the domestic supplies of these products and the registered demands of prospective users in the last years.

Year	Domestic output	Domestic supplies	Demand
1976	360	350	300
1977	186	186	435
1978	216	216	440
1979	197	197	453
1980	198	198	460
1981	120	120	481
1982	132	59	(?)

Clearly, domestic industry has failed to meet the demands of our users. It is no less obvious that a large proportion of users who are aware of the current situation never placed an order. It is also true that some of those who ordered them were uncertain of their needs and unfamiliar with the equipment, but I believe that these are in the minority.

The data do not provide the complete picture, because owning a minicomputer with the basic equipment (such as one monitor) is just a first stage in computerization in any field. This means just "playing" with computers. The statistics show that, in 1982 alone, 1722 minicomputers were in operation in Poland. With an average age of six years (total depreciation after seven years is assumed for minicomputers), this gives a specialist an easy gauge of their state and degree of modernization. Of this number, 1269 were produced in Poland, 182 were imported from CEMA countries and 267 units were imported from capitalist countries.

Most domestic minicomputers were Mera-300--unforutnately, unreliable (1717 units) machines with a poor computational capacity. Second place was held by the Mera-400 (237 units)--a 16-bit system with a small working memory and disc capacity, most of them in incomplete configurations.

It would be sheer demagoguery if I started to make comparisons with such industrialized nations as Japan, the United States, the USSR or the EEC nations. We have the questionable satisfaction of having fallen, as the computer equipment exporter in the CEMA nations markets, to the fourth place, trailing behind Hungary, the GDR and Bulgaria. The Soviet Union here is beyond competition. In that country, as many as 12 projects are carried on, aimed at assistance with the solution of scientific and technical problems in computerization.

In our economy, an increasing number of people are looking for their own "small" computer equipment. Some are grabbing at computers as a drowning person grabs at grass. Most understand the benefit of using computers in the new economic environment. What is the reality they have to face? One of the best units for our situation, the Mera-60 microcomputer, has a list price of around 4 million zlotys, but it would be naive to expect this price to cover all the equipment necessary to manage an enterprise, because for this money all you get is the basic set, which includes a processor, working memory, floppy disc memory and one monitor. This set could be sufficient for a scientist. The experts say that it is "unusable" and only investing 6 to 7 million zlotys can one arrive at a workable system. But money is not the major issue; a good economist could estimate the profits that this investment would bring. The bad part is the unavailability of equipment.

The Mera-60 is actually the first microcomputer produced in Poland on a large scale (?). Based on the Soviet microprocessor which originates from the PDP 11 (manufactured by DEC), this machine is fully compatible with the minicomputers of this company, which are popular all over the world. This compatibility is the reason for the relative success of the Katowice

Mera Ster. The model, the prototype and a series of 10 units were built in Katowice in 1979. In 1980, a contract was signed for supply of 60 computers to the Soviet Union (where the principal user is the Academy of Sciences), and that order was filled in the same year.

This export has been growing consistently: in 1981, 100 systems; 1982, 200; and 1983, 300. For 1984, Mera Ster is planning to export to the USSR as many as 500 computers. The producer leaves no doubt that it is concerned exclusively with export. This is not surprising, because exports are most profitable for the enterprise. In this period, domestic users have received about 200 systems from this producer, but the backlog of orders numbers another 200. These orders for Poland could at best only be filled within the coming two years.

Another Polish minicomputer which is included in the Systems of Small EMC--the SM-4--is equally unavailable on domestic markets. In a full configuration with four monitors, appropriate memory and a 5 MB disc memory, it costs today from 12 to 14 million zlotys. Similar systems are manufactured by our CEMA partners, but importing a corresponding system from a neighboring nation costs as much as 18 to 20 million zlotys, and if one is talking about a slightly improved version, such as with the addition of a disc memory 2 x 30 MB (Czechoslovakia), even 25 million zlotys might not be enough.

So we are in this situation: we are capable of producing an adequate (for our needs) minicomputer equipment, but we produce it mainly for export, and it is practically unavailable at home. In this situation, only maximizing output could help meet the market demand. Until now, it has been unclear how the final division of functions and spheres in computer production in the framework of the Uniform Systems will stack up. An additional complication comes from the fact that Poland has become a poor, maybe still reliable, but weak partner.

Shooting ... Without Guns

Some say that thanks to export our computer industry has survived the crisis. This may be true. Our partners, especially the Soviet Union, who provided the electronic assemblies, have helped. As far as the microcomputer Mera-60 is concerned, this is clear--the Soviet contractor supplies the basic subassemblies, including the core one--the microprocessor.

However, the weakness of our electronic industry cannot continue into infinity. One can hardly be reconciled to the loss of competitiveness by our products, such as quality, functional reliability and price, for the sole reason that we do not have our own good electronic components. One could hardly presume to take examples from such giants as IBM, but their attitude may be instructive for the "tiny" firms. In 1981, IBM invested $1.6 billion in research and development, mostly concerned with miniaturization of its products.

As a result, today it can design new generations of computer equipment every 3 to 5 years, rather than every 10 years, as in the period 1960-70.

Once again I will quote the sad statistics. Taking the output of electronic products per capita in Poland at 1, the corresponding indicator for Japan would be 10, 16 for the United States and 3.9 for South Korea. The close ties between the destinies of the computer industry and the production of electronic components are illustrated by these data: the most developed nations (United States, Japan and EEC countries) spent, in 1981, on their electronic components and equipment an amount of $200 billion. The following year the number grew to $220 billion. The allocation of these sums is most interesting: 19 percent went to the cost of electronic components and subassemblies, 36 percent went to computer engineering products (various computers, attachments, office automation facilities and software). Certainly, these statistics apply to nations which consistently improve the manufacturing of electronic components.

Our components base is gradually moving abroad,with the inevitable consequences. I have counted at least seven nations producing computer equipment. In the past two years, almost 72 percent of their products were exported. I am not against exports,especially if they occur under well-planned CEMA policies. I am apprehensive, however, that the benefits of enterprises oriented towards exports will be predominant in establishing these policies. From the point of view of the manufacturer, it is attractive to earn 1 million zlotys more for a minicomputer when it is exported, compared to the price it can fetch on the home market. Yet, the joy of economic reform provided in this way to the factory will turn to grief when all information channels in the economy go out of order. The fact is that precisely the equipment that is mainly made for export is necessary for developing (or modernizing) the computer configurations that are currently operated and are needed, especially if we want to develop remote data processing.

Not to mention how this would benefit the minicomputer industry itself. I would only point out that information specialists are on long waiting lists for working memories, line printers, communication processors, monitors and terminals with dot matrix printers. This means that even those mincomputers which are available practically only exist ... in statistics. They cannot be used for such purposes as, for instance, management.

The Elwro Electronics Enterprise, whose product nomenclatures have lately been out of tune, now promises that in the coming years they will bring to home markets a new microcomputer, the Elwro-500. Office microcomputer Elwro-513 is already developed, which makes use of an 8-bit microprocessor MCY 7880 (alternative to the Intel 8080). The attachments to this microcomputer include a display screen monitor, a floppy disc memory, a printer and a record card attachment. According to assistant director for marketing Bogdan Pronobis (PRZEGLAD TECHNICZNY 42/83), one can rejoice that in this case the system is built around the well-known "Polish" microprocessor.

At a high economic level, our production plans in telecommunications, electronics and computers should be coordinated with those of our CEMA partners. I believe, however, that, first of all, we should bring these things to order in our own backyard. It is not enough to be a reliable partner. We must also have a reliable and appropriate offering to make. Thus far, our producers of computer equipment are scoring their biggest triumphs in exports. But time is passing, and this is a field where staying in place is tantamount to moving backwards. And it is frightening to think of what would happen to one who has started to fall behind. The latest report of the Roman Club discussing the socioeconomic consequences of the development of microelectronics predicts that a nation which does not take part in this game--microelectronics--will surely take the place among the so-called Fifth World nations. That optimist on the Wisla will certainly sigh: "Haven't we been among the top ten industrialized nations of the world! Isn't it incredible."

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